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Odont. Soc. Lond. Trans.

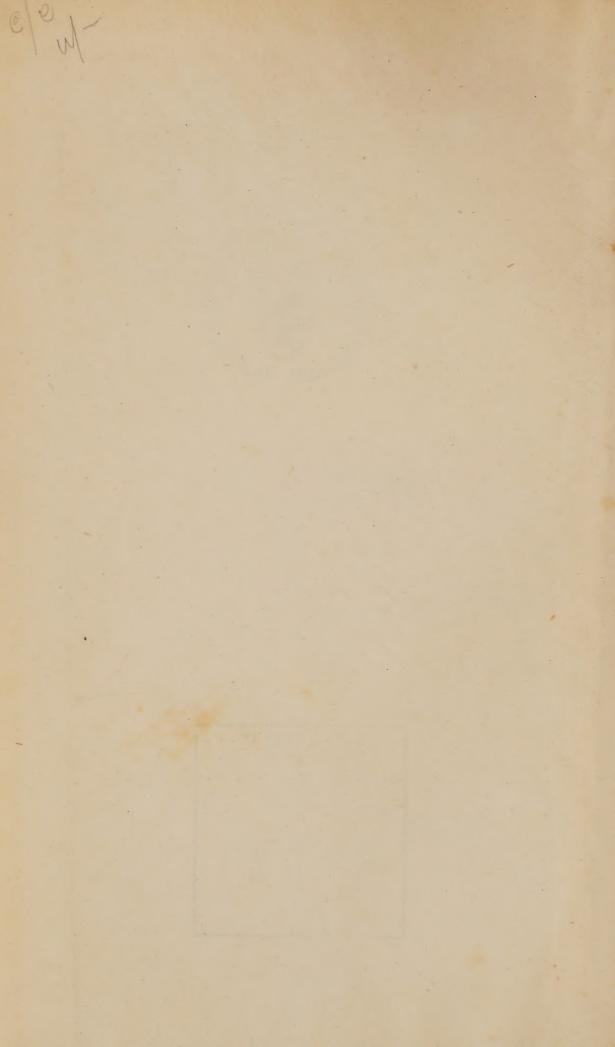
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TRANSACTIONS

OF THE

ODONTOLOGICAL SOCIETY

OF

GREAT BRITAIN.



VOLUME III.—NEW SERIES.

LONDON:

Aprinted and Apublished for the Society by WYMAN & SONS, 74-5, GREAT QUEEN STREET, LINCOLN'S-INN FIELDS, W.C. 1871.



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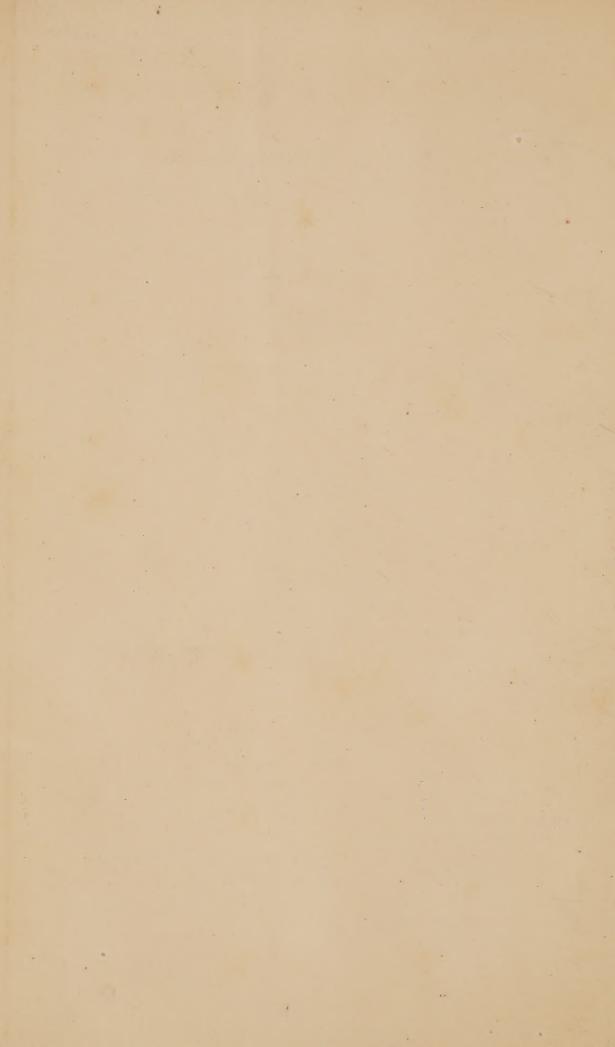
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HUMAN TEETH, FROM MR TOMES'S COLLECTION.



CROMO-LITH: E.J. FRANCIS, LONDON.

GENERAL MONTHLY MEETING,

Monday, November 7th, 1870.

ROBERT HEPBURN, Esq., PRESIDENT, IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed.

The following gentlemen signed the obligation book, and were admitted Members of the Society:—

Mr. George J. Silvester, of Worcester.

Mr. HENRY T. KIRBY, of Leicester.

The following gentlemen were elected members of the Society:—

Mr. ROBERT REID, L.D.S., 19, Heriot Row, Edinburgh.

Mr. THOMAS FLETCHER, 15, Bold Street, Warrington.

Mr. John S. Cobb, L.D.S., 23, King Street, Great Yarmouth.

The following gentlemen were proposed for membership of the Society:—

Mr. Wm. G. Ranger, M.R.C.S., 4, Finsbury Square.

Mr. John C. Tippitt, 10, Waterloo Road, Wolverhampton.

Mr. John A. Wilson, 108, High Street, Bangor.

Mr. J. HENRY REDMAN, 4, Pier Street, Ryde.

The following donations were made to the Society:—

Library. — Medico - Chirurgical Transactions, vol. liii. "Deutsche Vierteljahrsschrift für Zahnheilkunde." Redigirt von Ad. zur Neddin. Nürnberg.

Museum.—The skull of a Hyæna by Mr. Waller, of Cairo.

I. VOL. III.

A plaster cast of a superior maxilla, in which a wisdom tooth, instead of being erupted in the dental arch, had passed through the palate in the median line at the posterior margin of the hard palate. By Mr. Fletcher, of Warrington.

A right lower wisdom tooth with a large mass of alveolar process attached. There had been acute inflammation for three months in the socket of the tooth; upon its being removed the mass of alveolus exhibited also came away. By Mr. Murphy, of Bolton.

A small tumour springing from the periosteum of a decayed bicuspid tooth. Several masses of necrosed bone from the jaws of an infant about three years of age. A temporary incisor and canine united throughout the whole length of their roots. By Mr. Sewill.

Mr. Coleman said he had a suggestion to offer to the Society upon the matter of vulcanizers; that it was only a suggestion was due to the fact that he had not had the time requisite for putting it into practice. They all, probably, felt somewhat uneasy respecting their vulcanizers, on their own behalf, as also upon those employed in their work-rooms. It had occurred to him that if they surrounded their present forms of apparatus with a fluid that would boil at the temperature necessary for baking rubber, there could be very little risk indeed of an explosion, and they would more thoroughly insure a perfectly even temperature throughout the process. In searching for such a fluid, he found that a saturated solution of chloride of calcium would probably best fulfil the required conditionsbeing inexpensive, and boiling at about 320° Fahr. He thought a further improvement in the process might be effected by making each flask its own vulcanizer; this, he would suggest, should be accomplished by constructing the lower portion of the flask, now commonly used with a broad flange, upon which the upper portion should be screwed, and, over the latter, a cover made air-tight by a vulcanized rubber-ring. The vulcanizer might then be constructed upon the plan of an ordinary water-bath, in the place of the water the chloride of calcium solution being used, so that the process of vulcanization could

be made a continuous one, which would prove a great accommodation in the case of repairs and small additions.

Mr. Ramsay said, when Mr. Sewill read his paper before this Society on the various methods of taking impressions of the mouth for dental purposes, he (Mr. Ramsay) thought it was generally conceded that plaster of Paris was the best material that could be used for that purpose. As he had had upwards of sixteen years' experience in the use of plaster of Paris for this purpose, he trusted that they would excuse his taking up their time for a few minutes that evening, by explaining to them his method, and giving them any information that such experience might have enabled him to acquire. He had been principally induced to do so from reading the various methods described in the different journals. The directions given in every instance were so elaborate, and, in fact, he might say, so mystifying, that they were really quite enough to frighten any nervous person from ever attempting it. Now, the whole thing was so simple that he hoped, when he had explained his method, to do away with that feeling, and to induce some who had hitherto been afraid to attempt it to give it a trial, and not to be discouraged by one or two failures. He was certain if they once gave it a fair trial they would soon master its use, and when they had done so, they would never use anything else for modelling the upper jaw. Experience had taught him that there were cases of the lower jaw in which some other material than plaster of Paris was required: he referred to cases where absorption of the alveolar process had been excessive, and where flabby folds of the mucous membrane prevented the plaster of Paris getting down to the ridge. When such cases occurred, he found that some material requiring pressure must be used; he gave the preference to any other material. The trays he used were nothing more nor less than the ordinary trays used for edentulous cases. He stencilled these to prevent the plaster leaving the tray and remaining in the mouth. In taking impressions in exceptional cases, such as congenital cleft palate, he generally extemporized an impression-plate of gutta-percha, using an old teaspoon to form the handle, such as the one he then showed them. Should they

have very prominent incisor teeth, and wish to lengthen the impression-plate, it was easily done by adding a piece to it with gutta-percha.

The plaster to be used.—It was generally supposed that a quick-setting plaster was desirable. This was a great mistake, as it often happened that just when they were ready to introduce the impression-tray their patient wanted to cough or to spit, and by the time they had done this the plaster had set too hard; besides, when the tray was once in position in the mouth, if it had been judiciously introduced, the patient could allow it to remain there three or four minutes as easily as one or two. The plaster he used he obtained of Mr. Rutterford.

How to take the impression.—Having seen that the tray was sufficiently large to get well outside the teeth and gums, place the patient in an ordinary chair, pin a napkin round the neck, and direct him to sit straight up, the head inclined slightly forward, to open the mouth as wide as possible, and on no account to move the tongue or swallow while the tray was in situ. Should saliva accumulate it must be allowed to flow out of the mouth on to the napkin in front. Having explained the modus operandi to the patient, the next step is to mix the plaster. The water used should be tepid, and a small quantity of salt should be used, say for any ordinary impression as much as will cover a sixpence. The plaster should be mixed to about the consistency of thick cream; care being taken not to use too much,—rather err by having too little. Experience alone could teach them the quantity requisite in each case. As soon as it was found that the tray could be reversed without the plaster dropping, at once introduce it into the mouth. They had now to watch the plaster that was left in the basin, and when it was found to be sufficiently set to warrant the removal of the impression-tray, they were to do so at once and with decision. Here again he would say err on the safe side, and rather remove it too soon than allow the piaster to set too hard; in the former case they would only spoil the impression, but in the latter case they would not only spoil the impression but find great difficulty in getting it out at all. Experience alone would enable them to avoid

that difficulty. In nearly every case the impression would be fractured in two or three pieces (a pair of tweezers should always be at hand for the removal of any small pieces), but these would be easily put together again. Having got the impression, they should proceed to cast the model at once, care being taken to have the impression well covered with soap, to prevent adhesion. When they wished to remove the model from the impression they would find its removal greatly facilitated by placing the whole into boiling water for half a minute.

In removing the model from the impression the teeth were very apt to be broken. He had just been using a cement sent to him for trial by Mr. Rutterford, and which was the best he had ever used for repairing broken plaster models. He did not think he had anything else to tell them, but he would be happy to answer any questions that might be put to him on the subject. In answer to a member he said he never took any precaution to prevent adhesion to the mucous membrane. He never had any adhesion, and it could only occur when the plaster was left too long in the mouth. One gentleman he knew, who was troubled in this way, used to make his patient suck a piece of butter previous to his taking an impression.

Mr. Oakley Coles said he had a case to bring before the notice of the Society, which, although of itself not of sufficient moment to detain, was interesting, from being a fair example of a condition found in the mouths of patients suffering from inherited syphilis. There were not simply the malformed teeth with which they were most of them familiar, but a separation in the median line. He had lately had under his care four members of one family: in the oldest member, a lady forty years of age, there were the typical teeth, and a wide separation, not only in the upper jaw, but in the lower also; in the three other members of the family the typical character was lost, but he still found the excessive division in the median line. In patients who had been suffering for a long time from tertiary syphilis he had found the same condition. He would, therefore, like to ask those members who had seen such cases their opinions on the probable cause. The fact of the same

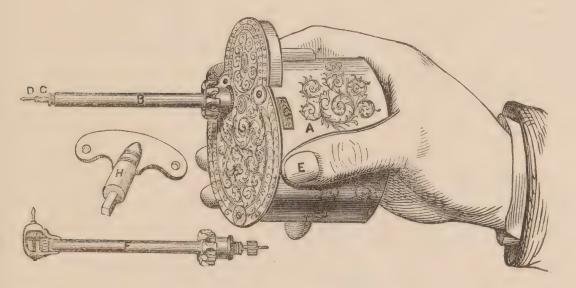
condition being often found in tertiary and inherited cases was strange, though it might be simply accidental or coincidence.

Mr. Coleman said he believed the circumstance noticed by Mr. Coles might be traced to the fact that these teeth were, in size, far below the average, and they therefore have the condition often observed where the jaws are in development in excess of the teeth they contain.

Mr. HARRINGTON exhibited a machine to supersede the use of the hand drill. He said the principle of the machine first suggested itself to his mind some eighteen years since; after almost innumerable attempts, he had succeeded in making it available for practice. About five years ago he had the pleasure of exhibiting one before the members of the Society, and very naturally, as the inventor of the machine, he flattered himself it would have been adopted by the profession, but in this he was disappointed. The chief objection to its use being that it was too noisy when in operation; he was bound, however, to say that, in his own practice, he had never met with any complaint from his patients on this score. Being anxious that his professional brethren might avail themselves of his invention, he had turned his attention to subduing the noise complained of, in which he had completely succeeded. The rapidity with which it worked would render it of great value to men in large practice; he calculated he could do as much in ten minutes with it as, with the ordinary hand drill, he could accomplish in one hour, and at the same time with much less discomfort to the patient. It would be found principally valuable in two classes of cases—one where the lines of decay ran in a cruciform manner along the grinding surface of molar teeth; these cases were too often but imperfectly stopped, owing to the difficulty of opening up the decayed line, but which could be effected with the machine under consideration in a few minutes, - the other, where it was found necessary to remove an amalgam stopping. Mr. Harrington illustrated, before the Society, the rapidity with which a stopping could be removed. The machine could be kept perfectly under control while in use, by the thumb of the operator, and its speed could be regulated with the greatest

nicety, or it could be instantly stopped. With one winding, it would work for two minutes. The present machine was superior to the former, not only from its noiselessness, but from the superior material of which it was made.

Mr. Fox said, as he had, through the courtesy of Mr. Harrington, had the opportunity of thoroughly testing the capabilities of the machine, he felt bound to give the result of his experience with it, which might be briefly summed up in the remark that, having used it for some months, he should be sorry ever to be without it again. Like everything else, it takes a little time to get accustomed to it. When once the first difficulty is overcome, it becomes invaluable in the operating-room.



The apparent cumbersomeness disappears after a little practice, the very weight of the machine being an aid in the drilling. A hand drill only cuts on the half-turn forwards; during the back turn no advance is made, but with this instrument you cut all the time it revolves. Although the silent form was best, he did not find patients object to the noisy one—they invariably prefer it to the hand drill, as being far more expeditious; but, in fact, he had always found that patients would believe in what you believed in yourself.

The machine is wound up the same as a clock, and should

never be allowed to run down without being checked by placing the thumb on the guide wheel E.

It is stopped by pressing the slide a towards the guide wheel E, and set going by moving it in the opposite direction.

When in use the thumb must always so touch the guide wheel E as to control its rate of speed. Experience will soon enable a practitioner to acquire perfect command.

To exchange a drill the pillar B must be unscrewed from the plate, the drill spindle c taken out of the pillar—a drill screwed tightly into its place, and adjusted to stand straight by means of pliers; the drill spindle is then to be replaced in the pillar, and the pillar screwed to the plate.

When a drill requires sharpening the pillar is to be unscrewed from the plate, the drill spindle taken out, the drill sharpened and replaced as before.

When in use the machine is held in the right hand so as to give the thumb perfect command over the guide wheel E. The drill is directed to the tooth, pressed against it with the required force, and its line of action guided by the forefinger of the left hand.

When the cross action is required the pillar B is to be removed, and the pillar F containing the bevel wheels screwed to the plate. To exchange a drill hold the bevel wheel between the thumb and finger, and, by means of pliers, screw the drill into the bevel wheel and adjust it to stand straight. When using the cross action drill the machine may be turned in any direction, and a finger applied to control the guide wheel E instead of the thumb.

The machinery will require oiling occasionally, and the drill spindle frequently, with best sperm oil.

Note.—Further information concerning the drill, may be obtained of Messrs. Coxeter & Son, 23, Grafton Street East.

The President then called upon Mr. Fox to read his paper.

Mr. Cartwright observed that the evening had already so far advanced that it would be impossible to discuss the paper;

and he proposed that if the paper were read then, its discussion should be postponed till the next meeting.

After a few remarks from Mr. VANDERPANT,

The PRESIDENT said that, as the paper was not a lengthy one, he thought it had better be read, and called on Mr. Fox to do so.



On the Position of Dental Surgery as a Profession. By Charles James Fox, M.R.C.S., L.D.S.

Mr. President and Gentlemen,-

A FEW days ago, when conversing with an old and much-respected Dental practitioner, I said, "You must come and hear my views on Monday next at the Society." He asked, "What is the title of your paper?" "On the Position of Dental Surgery as a Profession." "You surely," he exclaimed, "do not call our occupation a profession." "Undoubtedly I do," I replied, "when properly followed." But I confess I was somewhat startled to find that, instead of having simply to review the position of the profession, I should have to begin by making good the assertion that it was a profession at all.

When I first offered to read this paper before the Odontological Society, it never occurred to me that any proof was needed that Dental Surgery, or, if you will, *Dentistry*, could be regarded as anything but a profession. We are so in the habit of meeting one another on high professional grounds, of seeing amongst us gentlemen of high *professional* repute, of hearing papers read to us that could be considered as no other than

papers on purely professional subjects, that we have all come to consider ourselves, whether qualified or not, still honestly and sincerely members of a profession. But my friend, to whom I first alluded, is not a member of our pleasant company, and has, therefore, not had the opportunity of acquiring that amount of self-respect which would induce us to seek to ennoble the calling we follow rather than to degrade it, even in speech, from the ranks of the professions. But yet I feel that this gentleman's case, isolated as he is from companionship with his brother practitioners, really represents the position held by hundreds of our brethren in the provinces. Isolated, not by choice but by circumstances, they have no opportunity of meeting others who, although only Dentists, yet have won by their own good works the recognition of the world to their undoubted right to be considered professional men. But our provincial brethren have, with but few exceptions, little encouragement and every discouragement to seek to keep themselves in that rank of professional men which I hold they are entitled to by their calling; and I fear they often neglect those opportunities of legitimately asserting their position which their medical confrères would willingly accord to them.

When recently I attended a medical meeting at one of our large provincial towns, no effort was made by the Dentists of the place to attend the gathering, and meet their medical friends, even as visitors. I had reason to know that had they done so they would have been cordially received. A great check, however, to the cultivation of true professional spirit in the country arises from the fact that Dentists spring up in all directions who but a few weeks or months ago were engaged in the most common and humble trades. I am making no random statement, as many of my northern friends could testify.

As a man may be every inch a gentleman without having had the advantages of birth, so a Dentist may be a thoroughly professional man without having had the advantages of that learned education now so freely open to the rising generation. That there are many such among our provincial brethren I am proud to know, but that there would be many more under a different state of affairs I am equally sure. To return, however, to those who deny that the practice of Dentistry (I use the word advisedly in its broadest signification) is a profession.

Let us see first what Webster, in his dictionary, says: he defines a profession to be a calling, vocation, or employment, requiring a learned education.

Assuredly, think some of my cynical friends, we have you now!

What learned education is required to enable a man to make a set of teeth? What learned edu-

cation is needed for the extraction of a tooth, for the insertion of a plastic filing, or even of a gold plug? Are not these things done daily by the low, the vulgar, the illiterate? How, then, can you say that Dentistry is a profession or calling, requiring a learned education?

My reply is, that if it is not so, it ought to be so, and more, I affirm that to practise Dentistry properly with profit to our patients as well as profit to ourselves, it must be so.

Again, I affirm that if in some instances the illiterate or uneducated Dentist pursues his calling well, he would pursue it better still had he education to back him. And, if as an uneducated man he makes money, with education he would make more. But to return to the first assertion of our opponents—that a learned education is not needed to make a set of teeth—surely the whole end and aim of Dentistry is not to make a set of teeth, any more than to make wooden legs is the end and aim of surgery; but even on this point I will meet them, and maintain that the man with education and professional feeling will turn out a far more satisfactory set of teeth than the mere Dental labourer who works in a groove.

I have had some of these Dental labourers under me, and I was never so well satisfied as when I was quit of them; they had not an idea out of the ordinary run, they had no artistic feeling, and I maintain that there is as much needed

in the construction of a set of teeth as in any other art. Again, I believe that few teeth are better adapted than those that are made by the one who sees the mouth. And although they may be tried in by the operator on temporary plates, and the same end attained, yet I have always found that my mechanical work has given me most satisfaction either when, as in my younger days, I did it right through myself, or when, as in later times, I employed those about me whose artistic feeling, education, or gentlemanly bearing enabled me to let them see the patient and the peculiarities of the case they had to deal with, subject to my judgment; therefore, I say, that even on these grounds an educated mechanic is superior to an uneducated one. But surely it must be admitted that a knowledge of chemistry, metallurgy, mechanics, &c., must considerably add to the value of the mere mechanic. But even in the adaptation of teeth it must be admitted that a knowledge of the anatomy of the mouth, of the action of the muscles, and many other points, must increase the value of the operation and the comfort of the patient, whilst in dealing with irritable, nervous, or refractory patients, can we forget that old saying of our school days, which implies that the study of the liberal sciences has the effect of softening the manners, and rendering men less rude—

[&]quot;Ingenuas didicisse fideliter artes Emollit mores nec sinit esse feros."

Surely this is a strong argument on my side for the value of a learned education.

I have spoken so far only of the adaptation of teeth to the mouth, but how few Dentists there are who have not had more or less interesting cases of extensive oral deficiencies to treat, the treatment of which can certainly be best carried out by those who have had a medical and surgical education. But there are others in this room who have made this subject a special study, and I shall hope to hear from them on the subject. One, at least, has shown us how literary ability is not incompatible with mechanical skill. I need scarcely say I allude to Mr. Oakley Coles.

When we come to the more delicate operations of Dental Surgery proper-in the extraction, the treatment, the filling of teeth—how much more is a learned education needed. It is all very well to say that a man has practised so many years, extracted so many teeth, and never felt the need of a better education, but how many of those extracted teeth might he not have saved had his education, first general, then medical, been more advanced? But I feel it is needless in this assembly to say more on this point, and if I have said so much it is more for the sake of those who, remote from us, will read and not hear my words. We will then concede that Dentistry requires, or ought to require, a learned education, and that the fact of its requiring a learned education constitutes it a profession.

In all our great hospitals where a Dentist is attached he is looked upon by the staff as a professional man; and where he is not so, depend upon it it is the fault of the Dentist himself.

At the Westminster Hospital the Dentist, Mr. Walker, has been deputed by his colleagues to deliver the introductory lecture of the session. At King's College the Lecturer on Dental Surgery, Mr. Cartwright, has been promoted to the dignity of Professor Cartwright, holding a chair of Dental Surgery. At the Medical Society of London, to my knowledge, Dentists are listened to with attention and courtesy, whether they introduce artificial palates, or specimens of ivory filings, or mount some other favourite hobby,—such as nitrous oxide.

Within recent date two medical societies, those of Dundee and Preston, have admitted as members Dentists who held the L.D.S. diploma. And, again, when, not long ago, a brother Dental practitioner was most unjustly persecuted, medical men stepped forward to comfort and uphold the Dentist rather exceeding the Dentists in numbers. And on the only occasions when such a meeting had been held on behalf of a Dentist, Sir William Fergusson and Dr. B. W. Richardson, two distinguished representatives of surgery and medicine, took the chair.

Do not imagine that I am forgetting the weight and influence of the Dental Hospital of London,

the Odontological Society, and the Odonto-Chirurgical Society of Scotland, in bringing about that increased respect for the Dentist which is everywhere to be seen. We owe too much to these institutions for me to pass them over unnoticed, but their value is so self-evident that it would be waste of time for me here to dilate upon their interest and value.

It might enumerate various other instances, did time permit, but I must leave it to you, Gentlemen, to supply my deficiencies, and prove to those sceptical on this point how Dentistry has risen in the estimation of our medical confrères,—how it has been treated by them as a profession,—how it has been honoured as such, and how much more it may yet be honoured if Dentists will only be true to themselves and their calling, and neither disparage it by their remarks nor degrade it by their acts.

And this brings me to another and sadder view of the position of Dentistry.

I allude in the first portion of this paper to the position of provincial Dentists, who see around them every possible discouragement when they make the least effort to maintain their position as medical men. We in London are often told by these gentlemen that we do not appreciate their position; we cannot enter into or realise the enormous difficulties they have to contend with compared to the more fortunate London prac-

titioner. But it has fallen to my lot to have been for the last ten years in almost daily correspondence with country practitioners. I have received pages upon pages of letters arguing the pros and cons of the practice of advertising. I have received from many the most minute details of their troubles and difficulties (and their confidences are sacred to me), of their anxiety to relinquish the habit, and of the unfortunate result, as they thought, in some few cases of their having done so,—how after relinquishing the habit (for habit I will call it, as it grows upon the unfortunate victim to it like any other propensity), -how, after relinquishing the habit, I say, he looks round after a time, and finds in his neighbourhood not merely the vulgar and the illiterate, with their flaming placards, their attenuated and yet plethoric handbills—scanty in texture, overflowing in type—but he finds even the learned, the intelligent, the polite, the honoured member of societies, the holder of the Dental diploma, vaunting of their honours, their abilities, and the superior excellence of their works in the public press. Can we wonder that he speedily sinks back despondingly into the slough from which he had emerged? And those in whom he should find bright examples of true professional conduct,—those who forget the old French saying noblesse oblige—what is their excuse? Why, that their town, their neighbourhood, swarms with mushroom Dentists, who, by their advertisements, show-cases, and handbills delude a credulous public into the belief that they can obtain the true diamond of Dentistry at the price of paste. And thus in very self-defence they say they are compelled to advertise; and yet to my certain knowledge, there are many country practitioners with large circles of patients who do not and never did advertise. They have relied upon the real excellence of their work, on their kindly, gentle, courteous treatment of their patients, so to attach them to themselves, that people would rather pay them double the required fee than go elsewhere.

To advertise is in my humble opinion an admission of incompetency, or, at least, a public announcement that the advertiser is wanting in some one of those qualities which are needed to make a successful practitioner. That cheapness alone will satisfy the public, I and others could adduce many instances to show is not the case; and that Dentistry as a whole can be done at low fees I absolutely deny, although hundreds of successful instances may be adduced to me to prove the contrary; but this in itself would form a sufficient subject to occupy us a whole evening. I must, therefore, content myself with this passing glance at it and advertising, only pausing to repeat what I have said elsewhere—that no laws, no regulations, can ever put a stop to the practice.

The remedy must come from within. The reformation must be universal, or it will never be at all. Nothing but the refinement of mind, resulting from a general spread of professional education, will ever have the least visible effect upon it.

I spoke above of the way in which a practitioner can attach his patients to himself—by his skill, his gentleness, his courteous bearing; but how can we expect the mushroom Dentists, but a few weeks emerged from the workshop of some common trade (I cannot be more definite without running the risk of being accused of breach of confidence, seeing the delicate position in which I now stand before the profession)—how can we expect such men, I say, to possess these qualities as a rule? A great outcry has been made to me of the practice of more than one Dental depôt of manufacturing these sorts of Dentists at a cost of £10 apiece and sometimes less, for the express purpose of increasing the sale of their goods. And I have often heard it urged, that no Dentist should patronise a depôt which pursues such a course: but you cannot point to one-from the highest to the lowest—which has not at some time or another, directly or indirectly, done something of the kind; and in the existing state of the profession we cannot blame them, however much we may regret it. Many Dentists are equally, though frequently inadvertently, to blame in a similar way. A boy to sweep the workroom,

a servant in a time of hurry, taught to cast models, will often ultimately develop into a full-blown Dentist; therefore, although we may question their good taste we cannot justly blame those depôts who choose to add to their income by manufacturing Dentists as well as teeth.

But seeing the great evils which thus arise, both to the public and ourselves, surely it is time to bestir ourselves, and endeavour to put a stop to the indiscriminate entry into the "Profession" (for so I will nevertheless call it) of the refuse of every trade. And hence arises the great question, How is this to be done? It is not sufficient to provide the means of acquiring learning, nor to provide diplomas in proof of that learning; such things certainly give a man status, but how many hundreds there are who are satisfied with doing a good business, and care nothing for professional status. It is true they are wise in their generation, but such men should have been forced to pursue some trade, not have had the power to enter a profession where their presence is a manifest injury to those who have elected to spend much time and money in following out those more abstruse studies which will render them not only able to add to their own comfort in life, but will also entitle them to rank among the healers of men. I have said the great question is how the present sad state of affairs can be altered, but I believe the universal reply, from the highest

authority in the profession to the latest example of a mushroom Dentist, will be REGISTRATION AND COMPULSORY EDUCATION. Every one sees that clearly enough; but the real problem is, how that is to be brought about without, on the one hand, taking into our arms—equalizing with ourselves—a vast mass of corruption which would obscure for ever the beauty of the calling we desire to elevate; or, on the other hand, inflicting such an injury on a large number of most worthy but unqualified men, who would suffer with the good-for-nothing in a sweeping measure—which, by the way, no government would permit?

It may seem presumptuous in me to imagine that where so many older and wiser heads than mine have failed I may possibly have succeeded in hitting upon a scheme for bringing about this much desired result; but perhaps my presumption may be excused when I say that for years past I have been repeatedly urged to give my mind to this subject; I have been told over and over again, "Why waste your time in writing against advertising—in urging students to go in for full medical honours? Of what avail is all this? See the mire with which we are surrounded; your qualifications, your societies, are but as an ignis fatuus on the marsh—show us a real light—drain this swamp—arrest this inundation of the rude and the illiterate." I have felt humiliated in the face of such taunts. I have been silent, for I

could find no reply; nevertheless, can you wonder that the subject has been ever in my mind? and now I fancy I can see a spark in the darkness. I hasten to point it out to you, that you may tell me if it is a true light; sure that, if so, you will speedily fan it into such a flame that it shall never die out; and if it be not, let it pass away like other illusions. But even then I would fain hope that my paper will not have been in vain—that it will have served the purpose of turning men's minds more earnestly to this subject: for it is one that will assuredly overwhelm us if we do not grapple with it.

We do not need any great institution or society of any kind to work out the plan I suggest for adoption: a simple office, similar to the Medical Registration Office, is all that is needed. Let some future date be fixed upon, say 1875 or 1880, I care not when, so long as a definite determined time shall be fixed upon when the present anomalous position of Dental Surgery shall cease—I will not say to exist—but shall cease to continue increasing its anomalies. Whatever date is fixed upon, it should be at least three or five years after the promulgation of the Act of Parliament by which alone any such great event can be brought about. Let us, for argument sake, fix the date at 1876, and let it be enacted,

1st. That every one who, prior to that date, practised any branch of Dental Surgery, whether

mechanical or surgical, or whose Dental education had commenced prior to that date, no matter what his method of practice may be, whether he combines it with any business or advertises in any way—in short, every one who chooses to call himself Dentist—shall be entitled to register himself at the registration office as a Dentist, on payment of a small fee, say of one guinea. Unless so registered, no one should be entitled to recover fees for any kind of Dental work, either mechanical or surgical; and any one who neglects so to register himself before 1875, but who was then entitled to do so, shall be permitted at any future time to register on payment of double fee.

2ndly. That every one who, prior to 1875, possesses any medical degree whatever, be it M.R.C.S., L.D.S., D.D.S., &c., shall be entitled, on payment of the registration fee, to register and call himself either Dentist, Dental Surgeon, or Surgeon Dentist. And that no other but those so registered shall be allowed to adopt a title which implies that they possess a qualification. And, as before, every one who neglects that act of registration prior to 1875 shall be allowed at any time of his life to do so on payment of double registration fees, but without it he shall not be entitled to recover fees.

3rdly. For all those whose Dental education commences after 1875, there shall be but one registration, that of Dentist; and that any one

so registering shall be entitled to call himself Dentist, Dental Surgeon, or Surgeon Dentist, as he may please; but no one shall be so registered unless he possesses the Diploma of L.D.S., and any such general medical qualification as it seems to be in contemplation to establish. I cannot but feel that, after 1875, all those who hold certain foreign Dental Diplomas, such as the D.D.S. of America, should be admitted for examination for the English L.D.S. without curriculum; but without the L.D.S. they should not be permitted to practise in England. If the education of the D.D.S. is as admirable as we are informed it is, and as I believe it is when fully and faithfully carried out, the holder could have no difficulty in walking over the course at the Royal College of Surgeons of England; and if he cannot, the sooner he is prevented from practising the better for his patients.

Having laid this crude scheme before you, a scheme which will need much elaboration and careful study of detail if ever it should be adopted, permit me to say a few words in support of it. First, as to time: I would urgently advise that, in this or any similar case, the limitation should be remote, so that there shall never again be the complaint that men had not heard of it, or had not had time to ascertain the value or true bearing of the measure; and, of course, it should be kept constantly before their eyes by allusions to it in

the public prints, by advertisements, by circulars, &c.

You will see that, by this plan, which is somewhat similar though more comprehensive than that adopted by the Royal College of Surgeons in 1815, no diploma, no honour is conferred upon any one without examination; no additional dignity is thus given to any of the numerous intruders on the profession of Dentistry: they are placed in no better position than they now are, and we concede them no advantage that they do not now possess. Granted that we place Tom Jones, who yesterday was a brass-founder, on the same footing as William Fredrikson, Esq., who without diploma has been in practice some twenty years: what do we do more than is now done? Search your local directories; are you not there all alike classed as Dentists? what need, then, to cry out now? The fact is there; you cannot help it. By ignoring it you add to it daily. Admit it, then, frankly; register it--and kill it-with kindness.

Let me next plead, on exactly the same score, for the most unbounded liberality in the interpretation of the word Dentist. To get this Act passed at all it must be so framed that no single individual can suffer from it. I heard the other day of a village where the tailor at one end, and the shoemaker at the other, both "pull teeth." We cannot, nor ever could interfere with their

practice—and if they chose they might now call themselves Dentists—but according to my plan if they called themselves Dentists, they should be compelled to register and become the last of their race.

I need say but little on the subject of allowing a man who was entitled to register before 1875 being allowed to do so at any future time of his life. In my opinion it is never too late for repentance even in Dental matters, and I would never close the gates against even a repentant Dentist, although I am well aware that my views on this subject are not orthodox—indeed, are rank heresy.

In proposing by this act to prevent any but qualified men from assuming the title of Dental Surgeon or Surgeon Dentist, I propose nothing more than has been already attempted by the medical authorities, and will, I doubt not, be accomplished in any future act.

With regard to the 3rd clause, I am well aware that it will be urged that if every Dentist is compelled, as I hope he will be, to take a medical qualification (of course affecting only those whose education commenced after 1875), he will be registered in the medical register. Granted, but he would be so registered only as a medical man, and I would therefore compel him if he professes to be a Dentist, to register as such, and let him be thankful that he can do so.

As to my final expressions of opinion in the scheme, respecting the D.D.S., I hold the genuine American Diploma, earned by fair study, in the highest respect. Nevertheless, for many reasons which I cannot detail here without appearing personal, I would after 1875 impose those restrictions upon its use which I have mentioned.

Mr. President and Gentlemen,—I feel I have written but a meagre paper on a subject teeming with questions of the utmost interest and importance to each of us, but if I were to enter upon all the details I could wish, I should keep you here all night. One matter I have by no means forgotten, although I have not hitherto alluded to it, —that is, the question of chemist and Dentist, but I have avoided it so far simply because it would involve me in a long argument which would be foreign to the purpose of this paper. It suffices for my present purpose to look upon every one as a Dentist who so calls himself, no matter how he may conduct his practice. One of the great objects of a paper read before this Society is to place before it as briefly as possible a few salient points, expressive of the author's views, and to put them in such a fashion that they may give rise to an instructive discussion, inducing each member present to unfold his own views on the subject, and resulting often in an accumulation of far more valuable facts and theories than may be found in the paper itself. I have written this

paper under more drawbacks and discouragements than you could believe. I have besides been far from well, and, therefore, I pray you judge me a little leniently, and forgetting the manner in which it has been put before you, think only of the importance of the subject itself.

Mr. Fox then sat down, but quickly rose again, and said:—Mr. President and Gentlemen,—Just after I had written out the scheme you have just heard, I received a letter from a brother practitioner offering to me suggestions so identical with those I have laid before you, that I at once wrote and begged him to be present here to-night and express his views himself. As he was, however, unable to do so, I feel it is only just that I should read you his letter. At the same time I cannot but express my satisfaction at finding that there are others who so fully coincide with me in my views—it is encouraging.

12, George Street, Hanover Square, October 31st, 1870.

Dear Sir,—I have filled in the enclosed printed form, and in returning it to you, wish you every success in the proposed undertaking.* At the same time I hold the opinion I have entertained from the commencement, to the effect that the measure you propose falls short of the benefits to be desired; whilst your present scheme is calculated to confer an act of tardy justice on many respectable Dentists, well established previous to the formation of the Odontological Society, it fails to exclude for the future undesirable members from practising

What appears to me to be really wanted is a thorough sifting of the wheat from the chaff. This can only be done by recognising existing rights up to the present time, and zealously

^{*} This refers to the Dental Directory Circular.—Ed. T. O. S.

guarding all entrance to the profession hereafter, save by qualified men. This is doubtless a bitter pill to have to swallow; but it was the course the medical profession adopted at its reform, and has not proved its death. Neither do I think that the Dental branch would suffer materially by the same act. It by no means follows that, by recognising existing rights, unqualified members could claim a diploma. By adopting my suggestion, a large number of practitioners, who are now either hostile or indifferent to the obtaining of a charter, would probably unite in working for the common good. The result would be an expression of a general want represented by force of numbers.

If by following the above course additional facilities were given to the practising of non-eligible members, I would not recommend it; but as the case now stands, you cannot legally exclude such practitioners. Had the view I propose been taken when the reforming of the Dental profession was first set on foot, all Dentists that have entered the ranks for the last thirteen years without being duly approved would, by this time, have been discountenanced, and it would not now be necessary to go over the old ground again.

I beg to enclose a guinea towards the expenses of the movement, and again wishing you success,

I am, dear Sir,
Yours faithfully,
FREDERICK PEDLEY.

P.S.—You are at liberty to publish the above if it is likely in any way to test general opinion in the matter.

The President said, the paper we have just heard Mr. Fox read is not one to bear any discussion. At all events, it is a subject on which we cannot enter at the present occasion. The paper will be shortly before you under its printed form. Therefore, it only remains, in the name of the Odontological Society, to thank Mr. Fox, and those gentlemen who have made presents to our museum this evening, and have also brought forward several interesting and valuable casual communications.





HUMAN TEETH. FROM MR CARTWRIGHT'S COLLECTION



FROM PHOTOS. BY LOMBARDI RRIGHTON.

COMMO-LITH E A FRANCIS LONGON.

GENERAL MONTHLY MEETING.

Monday, December 5, 1870.

ROBERT HEPBURN, Esq., President, in the Chair.

The Minutes of the last meeting were read and confirmed.

The following gentleman was nominated as a non-resident Member:—

Mr. Leon Gablousk Platt, Stirling.

The following Contributions were announced to the—

Library.—" The Dental Diploma Question." By the Author.

Museum.—Five models, showing supernumerary teeth. By Mr. Kirby, of Leicester.

A tooth, showing absorption of fang. By Mr. J. H. KYAN, Preston.

Mr. T. Chartres White said, at their last meeting Mr. Henry Sewill presented to the Society an interesting specimen of what has been called "twin-teeth," and he begged on this occasion to offer to the Society microscopic sections, longitudinal and transverse, of two such teeth, and at the same time to ask if any definite theory had been advanced to account for this abnormal development; his own opinion, based upon the direction taken by the dentinal tubuli, being that, during the time the dental pulp was in a soft state, some constriction of the sac occurred, and thus occasioned the duplicature. He regretted that he had not brought his microscope with him that evening, that the members might have examined the specimens for themselves.

Mr. F. G. Bridgman said he had been requested by his father to present a specimen of dilaceration to the Museum. It was a left lower central incisor, the crown of which was bent forwards, forming a right angle with its root. He also wished to present a cast of an unusually large superior central incisor, if considered worthy of a place in the Museum.

Mr. Coleman said, if he understood Mr. White correctly, it was his opinion that the so-called geminated teeth had their origin by a budding off of a portion of a dental papilla, so that one papilla forms the double tooth. Were this view the correct one, he thought they would invariably find excess in the number of the teeth, whereas he had never once found this to be the case, although he had met with many instances of geminated teeth in the child. He felt most disposed to believe that their origin was due to a want of development in the septa between two papillæ during their follicular stage, whereby they become agglutinated together, much in the same manner as do the fangs of a tooth.

Mr. Ramsay presented the model of a case of irregularity which came under his notice on the 9th October last. The patient, a young lady of fifteen years of age, had the two superior central incisors articulating, as would be seen from the model, inside the inferior incisors, the other teeth being perfect. His only reason for bringing the case to the notice of the Society was to show the simple manner in which such an irregularity could be corrected by the use of an India-rubber elastic band. Mr. Ramsay then showed the model of the mouth as originally presented to him, also the appliance he used, and the model of the mouth after the appliance had been worn six weeks.

Mr. Sewill inquired if one of the objects of the meeting was not to discuss the paper read by Mr. Fox at the last meeting.

The PRESIDENT: No.

Mr. Braine requested the President to allow him to present a new anæsthetic agent, which had been lately

discovered by Dr. Liebreich, of Berlin, and which was called Ethyliden Dichlorid, but at the same time he wished to say he did not at present hold himself responsible for its good performances, and he only brought it before them that evening as being something new; although it looked like chloroform, and smelt somewhat like it, yet it differed from it in many ways.

The application of flame at once showed a difference; thus a small spill of wood, when saturated with chloroform, and held in the flame of a spirit-lamp, would evolve large quantities of carbon, and some chlorine; still ignition would not take place.

On the other hand, when ethylidenchlorid was used, the vapour of it would immediately ignite, and a beautiful green colour would be produced at the edge of the flame.

Like chloroform, it was soluble in alcohol, but it differed in being insoluble in water; whereas 288 volumes of water would dissolve one of chloroform. The boiling-point of both was the same, namely 140° Fah.

Its composition was said to be C₂, H₄, Cl₂. The statement he received about the anæsthetic was that, according to the testimony of celebrated Berlin physicians, who had employed it in many cases, "consciousness had been retained when all sense of feeling was absent. In no case had vomiting resulted, not even nausea, nor any other unpleasant symptom followed the anæsthesia. Berlin dentists had also administered it with great success in lieu of nitrous oxide."

Since the sample had been in his possession, he had tried it on himself four times, each time using about a drachm, on a piece of flannel. Each time he lost consciousness, but he was quite sensible to the pain caused by the prick of a knife so long as consciousness lasted. The second administration took place in each case as soon as the effect of the first had passed off. Both were followed by most decided nausea, which unpleasant feeling lasted for about forty minutes, when he went to bed, and fell asleep.

On Friday morning last, he repeated the double administration, with precisely the same result as to pain, viz.—that pain was felt so long as he was conscious, but very sharp vomiting took the place of the previous nausea. The vomiting in his case was so distressing that, until he received further details, which had been promised him from Berlin, he should not inhale any more of it himself; but if any gentleman in the room wished to be put under its influence, he should be most happy to show the effect on him.

Whilst he was speaking of anæsthetics it might, perhaps, interest the Society to know that since the 1st of April last year, nitrous oxide gas had been administered more than 2,100 times in the Dental Hospital; some of the gas used having been supplied by Messrs. Bell, and some having come from Messrs. Coxeter, both in the compressed and in the liquid form; but by far the largest quantity had been made in the building by their late excellent house surgeon, Mr. Milward Harding. As he had used so much of his gas, and had given him much trouble in making it, he would like to take that opportunity of thanking him for the great kindness and assistance he had always received from him during his tenure of office.

Some of the 2,100 cases were interesting, and if he would not be occupying their time too long, he would read them notes of a few. Sarah Lates, aged 24, while under the influence of the gas, appeared to swallow an upper molar root of large size, which had been removed from its alveolar cavity and had fallen into the mouth; she coughed occasionally, and complained of pain about the chest till 11 o'clock at night, when during a violent fit of coughing the piece of tooth came into her mouth, and was thus happily got rid of.

On July 20th, 1869, the gas was administered a second time to Jane Elliott, aged 29; and the note in the case-book went on to say that spasm of the glottis took place, the patient throwing herself back in the chair; some oposthotonos existing at the same time, the patient becoming very livid, and the respiration appearing to cease. Artificial respiration was commenced; two teeth were removed, the head being held forward while this was being done, and the patient recovered without knowing anything of the anxiety she had caused.

October 6th, Louisa Cook, aged 25, suckling a baby eight weeks old, came to the hospital with this history: that during the third month of lactation with a previous child, a tooth had been extracted without the aid of any anæsthetic. She suffered

much pain, and was very frightened at the time: in twenty-four hours the secretion of milk entirely ceased, and the child had to be brought up by hand. On the latter occasion gas was given, the tooth removed, and the patient a week afterwards came to the hospital and reported herself quite well in every way.

October 7th, Mr. Coleman gave a few respirations of pure nitrogen before the nitrous oxide, and he (Mr. Braine) found it mentioned that there was no lividity present; this was tried again some days later by the same gentleman, and then there did not appear to be any difference in the degree of lividity, whether the pure nitrogen was administered first or not.

In case No. 948, he found the following note appended, and as the case was one of Mr. Fox's, he was sure that gentleman would be happy to give them a more complete history of it. The note was as follows:--" Elizabeth Hayward, aged 17, an anæmic girl with a weak pulse, with whom hysterical symptoms commenced and continued for three-quarters of an hour, with apparent unconsciousness, respiration and pulse normal, con junctivæ sensitive, teeth clenched, with convulsive actions of the muscles;"—the note went on to say, "she came round at once on the entrance of a fresh person into the room." Mr. Fox saw her half an hour afterwards, and she had then quite recovered. Towards the end of November and during December some bichloride of methylene was used, but, on the whole, he (Mr. Braine) did not think the results were equal to those obtained by the administration of nitrous oxide.

During March and April of the present year the ethylic methylic ether had been administered to several cases, but had proved a most complete failure, and now, he believed, it had been universally discarded.

On May 28th, the following most instructive case happened. A patient, named Sarah Helsden, aged 25, applied to have some very difficult stumps removed from the left side of the lower jaw. Whilst inhaling the gas she coughed slightly; the character of the cough was that caused by relaxed uvula. His impression at the time was that she was going to be sick, and a basin was sent for. In about fifty seconds she became insen-

sible, and Mr. Milward Harding commenced to extract; he had removed one stump; and whilst he was searching for another that was deeply buried in the gum, he (Mr. B.) noticed that although the patient's chest was moving freely as in respiration, yet not one particle of air reached her lungs, and that she was rapidly dying of apnœa, on account of the tongue having dropped back over the glottis, thereby preventing the entrance of any air whatever. Mr. Harding, on the danger being pointed out, at once pulled the tongue well forwards, artificial respiration being commenced at the same time. The respiration, which at first was irregular, soon became normal, and she then made a good recovery. The case pointed out forcibly the advisability of having some one besides the operator to watch the effects of the gas; for in this patient's case, had the gas been administered by the operator, a fatal result would certainly have taken place. The number of times in which the gas had been administered to elderly people proved that they came as readily under its influence as those who were in the prime of life; and really there did not seem to be any limit to the age at which it might be given. A few days since he administered it to a lady aged ninety-four, and she took it as well and recovered as nicely as any one to whom he had ever administered it. He thought, however, on the whole, that old people required less gas to become insensible, and that the stage of insensibility lasted longer than in young people.

A boy, about three years old, was put on the operating-table for the operation of tenotomy. He disliked the recumbent position, crying violently when the facepiece was applied. In a few seconds he ceased crying; and then, continuing to breathe deeply as the result of the crying, he quickly became insensible, and the gas was discontinued. When the facepiece was removed, his tongue was dark, and lolling out of his mouth; but his respiration was regular and pulse natural. Instead of the respiration continuing normal, it became very irregular; his face looked pinched, and, beyond the slight chest movements at irregular intervals which he could feel while causing artificial respiration, he was to all intents and purposes a dead child. He continued artificial respiration during the whole time of the operation, as a last, and, as he thought,

hopeless resource; expecting he should have to tell the poor mother her child was dead. Just before the operation was concluded, he noticed the face was less blue, and that the tongue was drawn into the mouth. The child then breathed a few times of his own accord; the colour returned to his face; and, in almost less time than it had taken him to relate these particulars, he was quite well; and only those who happen to have had a similar case could imagine how thankful he was at that happy result. Children very rapidly get under the influence of the gas, more especially if they cry when the facepiece is applied, and then the administration of the gas should be stopped before there is complete insensibility; for if not, symptoms of danger suddenly supervene. Whether or not that was the explanation of the foregoing case, he could not say; but he was inclined to think it was, having had an opportunity some weeks afterwards of giving gas to the same patient with an excellent result. He examined the heart and lungs very carefully by auscultation, and failed to detect any organic mischief. On talking to the mother afterwards, she had told him the child was usuallly lively and well; but that when he cried his face became perfectly blue, and that it was some time before it regained its natural colour.

Pain and numbness in the lower extremities were sometimes complained of after recovery from the gas, more frequently in women than in men, and in one or two cases where there had not been any signs of hysteria. One lady, aged 24, on recovering, said that when becoming unconscious she felt great pain in her knees; she walked to her carriage without assistance, but in about four minutes complained that both legs, from her knees downwards, "were quite numbed, and felt as if they did not belong to her." On arriving at home, she was obliged to be assisted to her room on the groundfloor. She lay on the sofa, and fell into a dreamy condition, unconscious of everything that was passsing around, but apparently asleep, till she was spoken to, when she answered readily; and in answer to the question whether she wanted anything, she said that she was comfortable, but that her feet were cold; and as they were very cold to the touch, a hot-water bottle was applied, which, after some time, seemed to warm them;

but the difference in temperature between the upper and lower extremities was described to him by the lady who felt them at the time as being most marked. That these symptoms were the result of the gas seemed to be slightly confirmed by his experiments on the lower animals; for he had noticed that they always recovered the use of their fore extremities sooner than their hind ones, and that, after having apparently perfectly recovered, if they were made to walk quickly, the movements of their hind legs were uncertain and tottering. This would rather tend to show that the condition of the young lady was one caused by the gas; but there was this element of difficulty in the case, that during the previous night she had had a shivering fit, at which time her legs shook a great deal; and they all knew how likely pain was to follow those irregular muscular contractions. He might mention also, as the probable cause of her sleepy and dreamy condition on the sofa, that for the three previous nights she had been kept awake by pain in her face; and the cause of the pain being removed, it was most natural that the nervous system should recover itself by rest. Some two or three weeks ago another patient complained of pain and numbness in both arms, hands, and legs, and made her attendants bathe the former with hot water, to relieve the numbness. There were so many hysterical symptoms existing at the same time, that he believed it to be only one of many forms which hysteria puts on; and he was confirmed in this by the patient telling him that precisely the same symptoms had followed a previous extraction, when no anæsthetic whatever had been administered. At page 558 of this month's Dental Journal he found the following case related by J. L. Mitsom, Esq. :-

"Some few weeks ago a young lady, about seventeen years of age, presented herself to me to have an inferior molar, right side, extracted. She wished to be placed under the influence of the nitrous oxide gas for the operation. I asked her several questions to satisfy myself as to the propriety of administering the anæsthetic, and, amongst other things, wished to know how long it was since she had partaken of food. I found, about two hours previous to my seeing her (it being then about 3 p.m.), she had taken a very small quantity of food at the usual dinner

hour; she was suffering so much from the diseased tooth that she had but little inclination to eat. I therefore proceeded to administer the gas, and all went on as satisfactorily as possible, the patient being perfectly anæsthetized in about fifty seconds. I removed the facepiece, and immediately after I had done so, vomiting commenced freely. Being anxious to have the offending tooth out whilst the patient was in a state of unconsciousness of pain, I proceeded to operate, although under most disadvantageous circumstances, owing to the contents of the stomach coming up so freely. I succeeded in getting out the tooth at once, and the patient was quite unconscious of any pain during the operation. She awoke in about a minute after the tooth was removed, the vomiting going on for about another minute or two after she was restored to consciousness. Some little time was then spent by the servant who accompanied her in cleaning the dress, &c., which had become unavoidably soiled by the sickness, when the patient walked home, apparently none the worse for the operation."

Mr. Braine said that having met with two similar cases, and having had the opportunity of seeing others which had nearly vomited, he felt convinced the explanation was a very simple one. If they looked into the mouth of a patient who is thoroughly insensible from gas, they would see the uvula swaying gently backwards and forwards during inspiration and exspiration. Now if the uvula should happen to be in a relaxed condition, and the patient's head chance to be lying well back, the irritation caused by the uvula touching the parts in its immediate neighbourhood would produce the reflex act of vomiting.

Mr. Mitsom's case was sent to his friend and colleague, Mr. Clover, and in his explanation of it he says:—

"The fact of vomiting commencing within a minute of inhaling nitrous oxide is so contrary to experience that it is impossible to regard the inhalation simply as the cause of the sickness; but he was not informed whether she vomited blood. When blood is swallowed, it often acts like an emetic; and the loss of blood when the system is weakened by pain and loss of rest might account for an illness of three weeks."

He (Mr. Braine) could not agree with him where he

said "it was impossible to regard the inhalation simply as the cause of the sickness," for he (Mr. Braine) did not see any reason to believe the patient would have been sick had the gas not been administered; but he felt sure that the vomiting would not have taken place had the practice, which he always now adopted, been followed—namely, that of placing the head of the patient well forward as soon as any symptom of throat-irritation became apparent.

The suggestion that the vomiting arose from blood having been swallowed could not be entertained, for the vomiting preceded the extraction, and therefore at that time there was not any blood in the mouth to be swallowed; but he agreed with him that blood swallowed during many extractions at one inhalation was a fertile cause of sickness.

In both of his cases, seeing at the end of the administration that the patient was going to vomit, and looking around in vain for a basin, he turned off the gas, and then pressed the facepiece tightly on the face, and caught all the matter vomited (which exceeded half a pint) in the accessory bag; it spoilt the bag, but saved a very handsome green silk dress, which one of the patients had on at the time, and which she never would have forgiven his spoiling.

The President asked if he was in the habit of using any particular instrument for taking hold of the tongue? In cases of danger, such an instrument must be of great utility. A friend of his, a practitioner in the provinces, having administered the gas to a stout plethoric patient about fifty years of age, found the symptoms very alarming. The patient became black in the face, the tongue being drawn back and completely covering the glottis. Seizing the handle of a spoon, which fortunately chanced to be at hand, his friend was enabled to press the tongue forward by its aid, and thus allow the free admission of air, and the patient soon revived.

Mr. Coleman said he certainly had found, in those cases where the nitrogen was administered previously to nitrous oxide, that the patients inhaled the latter more tranquilly, appeared less livid, and recovered with more composure. But he did not consider that these advantages counter-

balanced the trouble of the double inhalation. His object in employing the nitrogen was, as it were, to wash out all oxygen from the lungs before administering the nitrous oxide, the presence of even a very small quantity of the former greatly interfering with the good effects of the latter.

Mr. C. Tomes said he was not in a position to enter at length into the chemistry of the compound Mr. Braine had exhibited under the name of Ethyliden Dichlorid, as his knowledge of this substance was derived only from an inspection of its chemical formula. Judging from this, he would say it bore much the same relation to ethyl alcohol (vinous alcohol) that chloroform bore to methyl alcohol, containing, however, less chlorine relatively, and being homologous with methyl bichloride. wished to relate a case very similar to one spoken of by Mr. Braine, and which he did not know how else to describe than as one of Hysterical Coma. The case occurred about eighteen months ago; the patient was an anæmic weakly girl, who was reduced by having taken very little food for several days, and by having passed several sleepless nights. Five or six teeth had to be removed, for which one administration was not sufficient; but as the patient recovered slowly after the first inhalation, he did not care to repeat the gas immediately. As she was obliged to return to the country that evening, he sent her away to get some lunch, with a request that she should return in about four hours. On her return she told him she had not been able to eat much, although she had had no breakfast, but had taken some wine, and seemed and felt stronger. Instead, however, of recovering after the second inhalation, she remained in a state of profound unconsciousness, from which he was quite unable to rouse her, the pulse being very feeble, and the breathing shallow and irregular. When she had remained for six or seven minutes without giving any manifestation of consciousness, he began to feel some alarm about the case, but a quivering of the eyelids and twitching of the mouth, followed by a few hysterical sobs, speedily reassured him. Still, however, he could not rouse her, though she opened her eyes when spoken to in a loud voice; she was then forced to walk, supported on either

side by her father and myself; but so soon as they relaxed their hold she dropped on to the floor, without any effort to sustain herself. At last she burst into a fit of hysterical crying, and began to regain her senses and the use of her limbs, though it was nearly an hour before she was sufficiently recovered to leave the house. On recovering, she denied all recollection of their efforts to recall her to consciousness, and had no idea that more than a few minutes had elapsed. He thought it worth while to bring this case under the notice of the Society, as such symptoms would always cause much alarm to the friends of a patient, and no small anxiety to the administrator of the gas, until he was fully satisfied of their hysterical origin.

The President said, if no other gentleman had any further communications to make, perhaps Mr. Coleman would favour them with some remarks on the removal of a tumour, performed by him last week at the Dental Hospital.

Mr. Coleman said the case the President had called upon him to report was the following: -Thomas March, æt. 9 years and 7 months, healthy, but delicate in appearance, the son of a sergeant in the Royal Artillery now stationed at Sheerness, had been sent to him, at the Dental Hospital, by Mr. Robertson, of Rochester. The following was the history of the case, as given him by his mother. About two years ago, when at the Cape of Good Hope, he had a fall, which so loosened his upper and lower temporary central incisors as to necessitate their removal. From six to eight months after this accident, he complained of a swelling situated near to the first temporary molar of the right side. The deciduous teeth of that side soon became loose, and were removed at various times. The tumour continued to grow, notwithstanding that it was burned on several occasions with caustic, and that, also to effect its removal, he frequently employed a lotion. Such was the history of the case. Upon looking into the patient's mouth, he (Mr. Coleman) saw situated upon the right side of the upper surface of the inferior maxilla, and occupying a position between the first permanent molar and the lateral permanent incisor, a growth about an inch and a quarter in length, three-quarters of an inch

in breadth and half an inch in height. In appearance it was of a deep fleshy colour, except at certain points, where, either from pressure upon it by the teeth of the upper jaw or the effects of the caustic before mentioned, it was of a grey colour. In its lobulated form and slightly elastic feel, it resembled an ordinary fibrous tumour (epulis) of the jaw; but its colour, and the age of the patient, led him to infer that it would prove to be myeloid. He first saw the patient on the 1st inst., and made arrangements for seeing him again upon the following day, for the purpose of removing the tumour, the parents being quite prepared for an operation. Having on the latter occasion obtained the services of Mr. Braine to administer chloroform, the patient being narcotized, he commenced the operation by an incision below the growth on its external aspect, and including some portions of healthy tissue. As this incision ran but a short distance above the lower border of the inferior maxilla, there was some little danger of wounding the facial artery. This, however, was avoided; and keeping the knife close upon the bone, the tumour was removed in a direction inwards. The smallness of the child's mouth, together with a very free hæmorrhage, which was, however, anticipated, added to the fact that the day was so dark that gas-light had to be employed, rendered the operation somewhat tedious and difficult. Being anxious to remove no more of the alveolar process than was absolutely necessary to prevent recurrence of the growth, on account of the permanent teeth which were exposed in the operation, and which he was most anxious to preserve, he preferred employing the actual cautery to the gouge or bone forceps, and which, besides, was necessary to arrest the free hæmorrhage; and so thoroughly did he use the cautery, that he felt almost confident that every portion of the bone from which the tumour sprung was effectually destroyed. Up to the present time the patient had done exceedingly well, and he was to return to the country the following day.

Upon examining the tumour, it was found to contain a portion of bone, the manner of its union with which undoubtedly showed it to have been formed by ossification of the growth, and not by separation of alveolus in consequence of the fall mentioned in the history of the case, and which he was inclined

to believe had nothing to do with its occurrence: it was a sequence, not a consequence. Upon cutting across the tumour, immediately upon its removal, it presented the colour and consistence of the muscular substance of the heart. Under the microscope, its structure was that of a fine fibrous or connective tissue, holding in its meshes numerous cells. The fluid, of serous consistency, scraped from the cut portions, contained abundant cells, nuclei, and large cells containing ten to twelve distinct nuclei characteristic of myeloid tumours, to which class this growth most undoubtedly belonged.

In connection with this case and its treatment, he would offer some observations upon a few of the most common forms of tumour met with in the region of the mouth, which came under the care of the dental surgeon; and this he intended to do very superficially, as the subject had come before them in a complete form at the hands of Mr. Christopher Heath.

Three forms of tumour were not rare upon that portion of the mouth in common language called the gums, and must be familiar to most, if not all, now present. The first to which he would direct their attention was a vascular tumour, or a growth in which the vascular element of the mucous membranechiefly the veins-had undergone hypertrophy. They did not often grow to any great size, and their increase was commonly superficial, though they were occasionally found pedunculated. In colour they generally presented a deep purple tinge, not unsimilar to venous nevi on the body; but, unlike the latter, they had not a congenital origin. They probably most closely resembled those tumours found situated between the muscles, and described as vascular tumours. The treatment of these growths was extirpation, either by the knife or powerful escharotics. The latter were not so effective in the mouth as on the surface of the body; the moisture of the former diluted them, and caused them to run upon parts not intended to receive them, as did also the closure of the mouth; so that the knife was decidedly preferable, which should be used freely, and always include some adjacent healthy tissue. After the knife caustics, or the actual cautery, should be applied to the subjacent bone. The largest tumour of this form he had seen was in the person of a girl eighteen years of age, who was a patient under the late Sir W. Laurence, whilst he was one of his dressers. It was situated upon the anterior aspect of the upper jaw, involving chiefly the left superior maxilla. It had been previously excised three or four times. Sir W. Laurence freely removed every portion of the growth with the knife, which, when removed, appeared, as is usual in the case of vascular tumours, to be nothing more than a little loose connective tissue; he then applied the actual cautery very freely to the bare surface of the bone; and, although the tumour passed between some of the teeth to the palatal process of the bones, he managed to save the teeth which had been separated by it. The growth measured about 2 inches in its longest, and $1\frac{1}{2}$ inch in its shortest diameter, and it projected about $\frac{1}{4}$ inch above the surface of the gum. Occasionally, under the free use of astringents, small growths of this kind have disappeared, and it may be well to try them before having recourse to the knife. Alum in powder, and tannin, he (Mr. C.) had found the most effective, but it was useless persevering with them unless the effects were rapid; delay only rendered the removal more difficult. He had, at the present time, a case of this kind under observation; it had resisted the astringent treatment, and the patient only waited recovery from a confinement to be operated upon with the knife.

The second form, perhaps rather less frequently met with than those which might be classed under the first head, especially if the small vascular growths so frequently seen in connection with carious teeth were included with them, was a tumour composed of a dense fibrous tissue. In form they were commonly lobulated, and in colour they did not differ much from the surrounding gum, but were usually rather paler. They did not seem more common to one portion of the alveolar process than another; he had met with them in all, but they were much more common to this region of the maxillæ than to any other. They undoubtedly sprung from the periosteum of the jaw or the teeth; and in many cases from irritation produced by such a cause as the sharp edge of a fractured tooth; and fangs of teeth had not unfrequently been found imbedded in their substance, as in a case described in Mr. Tomes's Lectures. The sharp edges of carious teeth, they were all aware, provoked the growth of the small

vascular tumours of the gum of which he had just spoken. So likewise might the sharp edge of a fractured tooth so irritate its periosteum, or that of the surrounding bone, that it might cause its hypertrophy into a fibrous epulis. This accounted for cause of origin of a tumour might well be borne in mind, as it might throw some light upon, at least, the origin of homologous tumours. In many instances, however, the fibrous tumours of the gum appeared without any assignable cause. It was of no use attempting their removal by any other means than excision; but this view could not be generally entertained, for he almost invariably found they had been repeatedly treated with caustic before they had been consigned to operation. In their removal it was most important that the subjacent bone should be well scraped or cut away, and this he had generally done with the gouge. He did not think it at all necessary to cut away the bone to any great extent, as was sometimes done with the bone forceps, although the use of the latter rendered an operation much easier and shorter. Should the growth appear to invade or arise from the periosteum of a tooth, even though sound, it was much the safer proceeding to remove it, as all the growths of which he was speaking became more troublesome to get rid of upon each occasion of their return.

The third kind of growth, that which had received at the hands of Mr. Paget the appropriate name of myeloid, was less commonly met with than either of those he had enumerated. It was not always easy to distinguish it when in situ from the fibrous variety, but it was generally less firm and elastic to the touch and deeper in colour, owing to its greater vascularity. As he had already described a case of myeloid tumour, he need not again mention their characteristics.

That they had an osteal origin, and therefore a deeper than that of the fibrous variety, would appear evident from the fact of their characteristic element—the large, many-nucleated cells they contained—being identical with those found in the softer portions of bone, and in bone undergoing growth. Such a view of their origin was, he had believed, original upon his part; but he had found that Mr. Paget had stated it, as his opinion, long before he (Mr. C.) could even have known of their existence. Though, apart from the subject upon which he was

speaking, the fact of these osteal cells being found in the small vascular bodies at the fangs of temporary teeth undergoing absorption described by Mr. Tomes, and called by him organs of absorption, could leave hardly a doubt but that the so-called organs of absorption were poliferating cells from their alveoli, which were capable of forming the bone-tissue, which advanced as the teeth became absorbed.

That myeloid tumours should frequently undergo partial ossification was only what they should have anticipated. Indeed, they might almost be looked upon as soft growing bone. Respecting their treatment it must be excision, and as their origin appeared to be deeper than in the case of fibrous tumours, so they would do well to remove more of the subjacent bone, and their more frequent recurrence perhaps be due to a want of freedom in this particular, which had led to their being regarded by some as approaching in character to malignant growths. In the case he had detailed to them this part of the operation was not done so thoroughly as he had recommended, but he considered it more desirable to run a small risk of a return than to sacrifice a number of permanent teeth.

Mr. Sewill said, as the subject of tumours of the jaw was before the Society, he might mention a case of malignant disease which had been recently under his care. A notice of the case in an early stage had appeared in one of the journals, and the unfavourable prognosis then made had been since verified, the patient having died. The subject was a girl about eight years old. She was referred to him by Mr. Teevans, complaining of some dental irritation. On examining the mouth he found the right upper alveolar border enlarged, and presenting the appearance seen in a bad case of alveolar abscess, but there were no symptoms nor history of The first upper molar, being extensively nflammation. decayed, was extracted; and, attached to the roots, there came away a mass of soft tissue about twice as large as the crown of the tooth. After carefully examining this tissue, he pronounced the case to be probably one of encephaloid cancer; the growth presenting that brain-like structure so characteristic of that

disease. The child was kept, after this, constantly under notice. A growth rapidly sprang from the alveolus, and in the course of a few weeks had become so large as to occupy nearly the whole cavity of the mouth, and seriously to interfere with breathing and swallowing. The right upper jaw was then removed by operation. The patient went on well for a time; but before she could be discharged from the hospital, the growth had reappeared in the wound, and, growing again with great rapidity, ended by causing the death of the patient from exhaustion within about five months of the discovery of the disease.

Mr. Coleman asked Mr. Sewill if that growth had its origin in the periosteum or was a portion of it only, accidentally brought away with its fangs. They knew that frequently disease in the maxillæ was first referred to painful teeth, and to their removal under such conditions was often erroneously attributed the origin of the disease itself—a circumstance which ought to make a beginner very careful to ascertain the cause of pain in a tooth before its removal. Malignant disease connected with the periosteum of a tooth was so extremely rare, that he was anxious to receive a reply from Mr. Sewill to his question.

Mr. Sewill said he was glad Mr. Coleman had asked the question, for it enabled him to add what he had forgotten to mention while describing the case — that he by no means looked upon the tumour as in any way due to dental disease. The attachment to the roots of the molar was accidental, and due, doubtless, to simple adhesion to the growth, which had probably originated in the antrum.

Mr. Cattlin, reverting to the case of coma after the administration of nitrous oxide gas which had been described by Mr. Charles Tomes, said he had recorded a very similar case, which happened in his practice at Brighton. The patient remained in a semi-comatose state about an hour after she had inhaled a second dose of nitrous oxide gas. Strong tea was repeatedly administered, and the young lady was made to walk about between two assistants until consciousness returned. She had since been in good health.

As the evening seemed to be devoted to the description of "interesting cases," he (Mr. C.) would relate the particulars of a case now under his care. The patient was a young lady, aged sixteen, who suffered aching pain along the labial border of the gum above the upper incisor, canine, and bicuspid teeth. The gums were swollen and congested, and a discharge exactly resembling cream oozed from beneath the gum when slight pressure was made from above downwards. The teeth were tight, and quite healthy. Percussion did not cause any uneasiness; but so much pain was produced in the gums by mastication, that the patient feared to take solid food. Several very free incisions were made in the gum and soft palate. Gregory's Powder was taken as an aperient, and the gums were repeatedly painted with a strong solution of tannin. In a chronic form, this particular disease, which was always attended with a creamy discharge, seemed to defy every kind of remedy, and, according to his experience, was very difficult to cure.

Mr. Sercombe thought a very similar case to the one described by Mr. Cattlin would be found in the paper he had the honour to read before the Society some years ago on "Inflammation in the Tissues of the Mouth." In that paper he dwelt on the value of the iodide of potassium in small doses. He would venture to recommend it to Mr. Cattlin's notice.

Mr. Cattlin was not aware that the disease had been described by Mr. Sercombe in his paper on Periostitis; but the iodide of potassium, in combination with bark, was now being administered with beneficial results. He recollected to have read a faithful description of it in an American work (Dr. Wood's "Practice of Medicine"), the latter pages of which contained some valuable suggestions relating to dental surgery.

Mr. Turner thought the subject mentioned by the two previous speakers professionally interesting. He had met with several cases in his practice presenting, with slight variations, the features described by Mr. Cattlin. The gums seemed soft and turgid, but on pressure proved hard and brawny. Some cases exhibited the phenomena of metastasis, the disease occupying sometimes one side of the mouth, which it would

leave and pass to the other. At other times it would occupy the whole circle of the teeth. These cases did not present the usual features of periostitis. The pain was intense, and the patients refused to eat. He never tried the iodide of potassium. So erysipelatous did the inflammation appear in its character, that he was induced to try iron, with a stimulant to get rid of it, and he must say he had found the result most satisfactory.

The President said he thought that they had had a very interesting evening, and were much indebted to Mr. Braine for his remarks on the administration of nitrous oxide gas in exceptional cases, and to Mr. Coleman for his memoranda on the subject of tumours. They had obtained valuable information from both gentlemen, and he begged leave to offer them the thanks of the Society. Thanks were also due to those gentlemen who had favoured them with most acceptable contributions to the Museum and Library. The next meeting, being the Annual Meeting, would take place on the second Monday in January.

ANNUAL GENERAL MEETING,

Monday, January 9, 1871.

ROBERT HEPBURN, Esq., President, in the Chair.

THE Minutes of the last Meeting were read and confirmed.

Mr. W. George Beers, of Montreal, Canada, was recommended by the Council as a Corresponding Member of the Society.

The following gentlemen were duly elected Members of the Society:—

Mr. WILLIAM GILL RANGER, M.R.C.S., 4, Finsbury Square, E.C. (resident).

Mr. John Collins Tippett, 10, Waterloo Road, Wolverhampton (non-resident).

Mr. J. Henry Redman, 4, Pier Street, Ryde (non-resident).

Mr. John Addison Wilson, 105, High Street, Bangor (non-resident).

The following Donation was made to the Museum:—

Mr. Bayley presented a model of a mouth in which there were three central incisors, one of the three of unusual size, being in place of the lateral. He also exhibited some ingenious forceps, manufactured by Collins from American patterns, for the removal of very carious molars.

Mr. Coleman had seen, upon several occasions, the forceps brought to the notice of the Society by Mr. Bayley, used at

the Dental Hospital, and he was happy to state that, on each occasion, they quite successfully carried out the object in view.

Mr. White said that, in examining the pulp-cavities of teeth, two kinds of osseous deposit might be met with in the pulp, viz., secondary dentine, which consisted of a rough and irregular formation of Dentinal Tubuli continuous with the original structure, and generally found in the upper part of the pulp, especially if that pulp had been the subject of any irritation from advancing caries, or the cutting edge of the tooth had been ground down from wear. The second kind might be termed Nodular Dentine; this was abundantly met with in the pulps of temporary teeth, and occasionally in those of the permanent teeth it occurred as semi-transparent, structureless nodules distributed through the lower part of the pulp. While their number and their size were limited, little, if any, inconvenience would be created by their presence; but should they become enlarged to any extent, and press upon the delicate nerve-fibres of the pulp, they would give rise to great pain, and in some cases might even necessitate the removal of a sound tooth; this alternative was, however, happily of rare occurrence, but that this necessity might occasionally arise was evidenced by the case to which he wished to call the attention of the Members that evening. A patient of his brought her son, about eight years of age, to him to consult him in reference to continued pain suffered in a lower temporary canine. The tooth being quite sound and firm, he advised that the gum should be well rubbed with spirits of camphor as a counter-irritant, and that the boy should be brought to him at the end of a week to report progress; but before the expiration of that time the mother begged of him to remove the tooth, and to cut short the incessant pain he endured, which he accordingly did. Having some years since had a similar case, in which a sound left lower permanent bicuspid gave the patient intolerable pain, and in the pulp of which tooth he had found a large growing mass of nodular dentine pressing the sensitive pulp against the walls of its cavity, it occurred to him that this pain might have arisen from a similar cause, and he carefully opened the tooth and examined the pulp under the microscope, when

he found an osseous deposit unlike either Secondary or Nodular Dentine, both as regards shape and structure. It was a lobulated mass of what might be at first sight compared to very coarse cementum; and bearing in mind that the cementum does sometimes extend from the outside to a little way within the foramen of the fang, he felt inclined at first to attribute its origin to that cause; but upon more closely examining into its structure, he found that it was more nearly allied to the osseous tissue found in the cancelli of bone, and that its origin was separate and independent from the cementum, its lacuna large and irregular, and marked by the absence of the delicate canaliculi observed in the cementum. It filled very nearly the whole of the cavity at the junction of its middle and lower thirds, and was pressing the fasciculi of nervefibres out of their course; and no doubt existed in his mind that this occasioned the pain the patient suffered; this opinion being strengthened by the fact that two months have now elapsed without a visit from his little patient. The uncommon character of this deposit, and its bearing on the obscure pains experienced by some patients in their teeth, induced him to believe that it might probably have an interest for some of the Members, and he had therefore determined to hazard its introduction to their notice that evening, and also to place the specimen under the microscope for their inspection, with the hope that the subject might be fully discussed, and that he might be a gainer by the more extended experience of others.

Mr. Sercombe would be glad to know if Mr. White believed that the peculiar ossific formation he had described was confined to the pulp of the teeth of young persons, or whether it was common to all ages. Probably, every one present had been requested by patients occasionally to remove perfectly sound teeth because of the pain they occasioned. One class of such cases was where the tooth stood alone, having long lost its fellows. The pain in such a case had always struck him (Mr. S.) as due to the exposure of a certain portion of cementum which nature had not intended should be exposed to external influences. He would be glad to know how such a condition as Mr. White had described could be diagnosed.

Mr. Coleman said as Mr. White had expressed a wish that any Member present having met with cases similar to his own should report the same, he would mention that, several years ago, he met in consultation a general practitioner upon a case where great pain was attributed to an upper bicuspid tooth which was apparently quite sound. Other remedies having failed, extraction was resorted to, and, upon splitting open the tooth, it was found that the canal in the fang was, at one point, much restricted; as no section was made, it was impossible to say whether the contents of the canal were encroached upon by dentine or cementum. From what Mr. White had just told the Society, it was possible it might have been the latter structure.

Mr. Turner begged to ask Mr. White if the pain complained of had been progressive. The points of diagnosis in such cases are very obscure. He had heard that, in some instances, the pain had been aggravated when the patient moved the head into certain positions, as if the foreign body were loose and pressed on the delicate tooth-pulp. That was one point. If we could learn something of the character of the pain, &c., we might make another point, and so be able to arrive at a proper conclusion in those rare and interesting cases.

Mr. White said, in reply to Mr. Sercombe, that only two cases had come under his notice of this kind; one, that of a young lady about seventeen years of age, who for some time had been treated for neuralgia, and in whom all the teeth on the affected side were sound. She referred the pain to an inferior first bicuspid. Thinking, all the teeth being present except the Dens Sapientiæ, that the pain arose from mutual pressure, he filed a division between the two Bicuspidati, but yet failed to give relief; and then, at the urgent solicitation of his patient, he extracted the offending tooth, which, upon being opened, revealed a globular mass of osseous deposit in the upper part of the pulp. In this case, the patient being young and the teeth all present, no suspicion that the pain might arise from denudation of the fang entered his mind, nor did the real cause manifest itself till the tooth was opened. In

cases of denudation of the fang, the pain generally disappears before the daily application of some spirit, either alone or in conjunction with an astringent. In answer to Mr. Turner, Mr. White said that it was exceedingly difficult to get the real history of the rise and progress of pain from patients—that they generally gave us, and were quite satisfied in giving, the crudest elements of diagnosis; and therefore, in the case brought forward that evening, it was only the increase in the pain in that particular case, and the urgent request of the mother, that led him to extract the tooth, which an examination of the pulp fully justified him in doing.

A portable and convenient gasometer, to be used with liquid nitrous oxide gas, was exhibited by Mr. Fox.

The Treasurer then read the Financial Statement for the year ending October 31st, 1870, which showed that the receipts were £369. 9s., and the expenses £281. 16s. 10d.; and that the entire assets of the Society down to this date were—Cash at banker's, £288. 15s. 1d.; stock in New Three per Cents, £706. 12s. 8d. He also read a further statement, showing that the Society had lost from deaths and other causes eight Members during the year, and gained, by new elections, nine; and that the number of Members at the above date was—Resident, 92; Non-resident, 147; Honorary, 24; Corresponding, 21; making a total of 284.

The LIBRARIAN reported that, though the additions to the Library by purchase during the past year had not been quite as extensive as in some former years, he had the pleasure of being able to report that the Library was in a very efficient and satisfactory condition.

The following gentlemen were unanimously elected as Officers and Council for the year 1871, Mr. Charters White and Mr. H. B. Longhurst acting as scrutineers to the balloting:—

President.—J. R. Mummery, Esq.

Vice-Presidents. — Resident: Thomas Underwood, Esq.; Alfred Canton, Esq.; Isaac Sheffield, Esq. Non-resident: George T. Parkinson, Esq. (Bath); Joseph Snape, Esq. (Liverpool); John A. Baker, Esq. (Dublin). Mr. Fletcher had requested that his name might be withdrawn from the List of Vice-Presidents of the Society, in consequence of severe domestic affliction.

Treasurer.—W. A. Harrison, Esq.

Librarian.—Charles Vasey, Esq.

Honorary Secretaries.—Ordinary: Edwin Sercombe, Esq.; G. Gregson, Esq. For Foreign Correspondence: Charles James Fox, Esq.

Councillors.—Resident: J. W. Elliott, Esq.; Thomas A. Rogers, Esq.; John Tomes, Esq.; Samuel Cartwright, Esq.; G. A. Ibbetson, Esq.; T. C. Vidler, Esq.; W. F. Forsyth, Esq.: Robert Ramsay, Esq.; E. H. King, Esq. Non-resident: J. Steele, Esq. (Croydon); J. S. Coles, Esq. (Plymouth); H. Barron Rodway, Esq. (Torquay); S. Clifford Gibbons, Esq. (Brighton); G. S. Williams, Esq. (Clifton); J. H. Martin, Esq. (Portsmouth).

The President read the following valedictory address:—

Gentlemen.—The election of President, Vice-Presidents, Council, and other office-bearers, now concluded, brings our official year to a close, and also the duties of the office I have had the honour of holding to a termination. Before, however, resigning into your hands the presidential chair, permit me to follow in the wake of my predecessors by offering you a few brief remarks.

Notwithstanding the political agitations which have stayed the progress of civilization in most countries of Europe, and the devastating horrors of war which have stemmed the tide of progression in lands not far from our own shores, there is every reason to feel thankful that, in England, during the past year, science has made steady advances, and its votaries have been left in calm tranquillity to pursue their patient and laborious researches and investigations for the benefit of the human race. This fact is, I think, fully exemplified in the views and opinions expressed by the Presidents of the various sections of the British Association, in their opening addresses, delivered at the annual meeting held in Liverpool in the month of September, and especially in the address of the distinguished President of that body, Professor Huxley.

But, gentlemen, to confine ourselves to that which more immediately concerns us, collectively, viz., the proceedings of the Odontological Society, I think we have sufficient reason to feel satisfied with what has been accomplished during the last two sessions. It is a somewhat delicate task to notice the various papers read by our ordinary members, especially when all are worthy of high praise; but, in drawing attention to the contribution of an honorary member, to whom we are, for the second time, indebted for an able paper, I need have no reticence. I allude to that of Dr. Murie. The subject chosen by him was one of considerable interest, viz., "Some Abnormal and Diseased Dental Conditions in Animals," and was divided into five sections:—1st. Excessive growth or elongation of the Teeth; 2nd. Irregular wearing, denudation, or abrasion; 3rd. Erosion of the Denture; 4th. Enclosed foreign substances in Teeth; 5th. Fractures of the Teeth. These classifications, treated in a scientific and practical manner, gave rise to a lengthy and animated discussion. I trust we may, on future occasions, be favoured with more papers from one so zealous in the pursuit of natural history and science as Dr. Murie.

The first paper of the year was read by Mr. J. Oakley Coles, on "The Treatment of Defects of the Palate produced by Syphilis," and was illustrated by numerous diagrams. After describing the various symptoms of secondary and tertiary syphilis in the parts which come under the more immediate notice of the dental surgeon, Mr. Coles gave a detailed account of the method of manipulating and applying soft rubber obturators to such cases, with clear practical explanations. This is the third paper we have had on the same important subject; the first being by Dr. Norman Kingsley, the second by Mr. Ramsay.

The subject of "Treating Chronic Periodontitis by Replantation" was brought forward by Mr. Coleman in a very elaborate paper, in which he detailed the results of his method of treatment, describing many cases of patients under his care at the

Dental and St. Bartholomew's Hospitals. An opinion has been prevalent for many years past that, at the decease of John Hunter, the operation of replantation became extinct, and Mr. Coleman deserves much credit for reviving a subject so fraught with interest. This paper gave rise to a spirited discussion.

To Mr. Coleman we are also indebted for copious notes on the excision of a tumour, an operation performed by him at the Dental Hospital.

The paper written by Mr. Bridgman, and read by Mr. Bridgman, junior, in May, was a characteristic one, on "The Electro-Chemical Action of Metallic Substances upon the Teeth." In treating this intricate and interesting subject, Mr. Bridgman showed the power which an intimate and comprehensive knowledge of chemistry gives, as previously demonstrated by his researches and experiments with voltaic electricity on organic compounds, &c. &c.

At the first meeting of the winter session Mr. Charles J. Fox read a paper on "The Position of Dental Surgery as a Profession." His views and opinions, ably expressed and advocated, on the past, present, and future of the profession, were listened to with marked attention, but the subject not being of a scientific nature, no discussion took place.

We are indebted to Mr. Braine for giving us, at our last meeting, some valuable memoranda on the action of nitrous oxide gas in exceptional cases. Mr. Braine's experience in the administration of this anæsthetic made his observations of peculiar value, and his practical hints will, no doubt, prove useful in a variety of cases.

In addition to these papers we have had numerous casual communications of great value, elucidating many obscure points in the surgical, physiological, and mechanical branches of dentistry. I regret that the limited time at my disposal does not permit me to enumerate these. Suffice it to say, they have proved to be most useful auxiliaries in advancing the true interests of the profession.

With regard to the financial department of our Society, it is most gratifying to find, from the report of the auditors, that it is in a very satisfactory condition. I believe we have now

more funds in hand than at any previous time. We ought to congratulate ourselves on retaining the aid of our respected friend Mr. Harrison as Treasurer, and I trust he will be long spared to continue those invaluable services he has for so many years willingly rendered to the Odontological Society.

Thanks to the liberality of various members, our Library is steadily increasing. In the early part of the year it received an important addition of nearly 100 volumes, the gift of the Messrs. Rogers. In this department Mr. Coleman has displayed his wonted zeal, and we lose his good offices with great regret.

Many valuable contributions have recently been made to the Museum. Through indisposition, our late Curator, Mr. Hulme, was prevented from giving that supervision to its arrangements which he was otherwise so well qualified to give; but it augurs well for their being in a few months in a most satisfactory state, that Mr. Charles Tomes has accepted the vacant office. From the peculiar skill and taste he has already displayed in classifying and arranging the numerous objects, I have no doubt but that it will eventually become a Dental Museum quite unique in this country.

It must be obvious to all that the Members of the Publication Committee, and especially Mr. Sercombe, have a laborious and onerous task to perform. They have fulfilled it with very great care and judgment. We fully appreciate their exertions, and the regularity with which the "Transactions" are published and delivered is a source of great satisfaction to every member.

Too high a meed of praise cannot be bestowed on our worthy Secretaries, Messrs. Sercombe, Gregson, and Fox, for the amount of devotion and energy they have displayed in the fulfilment of the duties attached to their office—duties necessitating an expenditure of labour and time which they have unsparingly given, and for which we owe them a debt of gratitude.

Gentlemen, from these details I think we may safely come to the conclusion that we have not only reason to be satisfied but may be justly proud of what the Odontological Society has already accomplished, of its present condition of prosperity, and of its prospects of future utility.

So far we have only spoken of what is bright and cheerful,

but every picture must have both lights and shadows; and with deep regret I must now call your attention to the great losses we have this year sustained by the removal from our midst of some of our most distinguished and valued members. The death of Mr. Arnold Rogers took place on March 18th; of Mr. Francis Hay Thompson, of Glasgow, on May 21st; of Mr. Hulme (our late Curator) on July 9th; of Mr. Nasmyth, of Edinburgh, on July 12th; of Mr. Robertson, of Birmingham; and of Mr. H. R. Rowe, of Preston, I believe, about the same time. The great loss which our Society sustained by the death of Mr. Arnold Rogers has been severely felt by every member who ever had the good fortune to come into personal contact with him. His kind and genial manner has left a lasting impression on the hearts of his professional brethren; and his genuine sympathy with young practitioners, combined with the able counsel so willingly bestowed on all who sought his advice, will long be held in remembrance by many.

Mr. Rogers was, for nearly forty years, a leading practitioner in this metropolis, and was eminently distinguished for the untiring zeal and devoted attention he gave to professional pursuits. At a time when Dental Surgery was more lightly esteemed by the medical world in general than it is at the present day, he upheld the dignity of our profession, feeling convinced that it would ultimately take its rank with the most liberal and humane of all sciences, viz., that of Surgery. he lived to see accomplished. Gentlemen, in our surface contact with our fellow-men, it is but seldom that the true and deeper feelings of our nature have unreserved scope; but as we pass through life there are occasions which make enduring impressions; and I shall never forget the emotion with which our departed friend expressed his warm attachment to our Society, when, little more than three years ago, Mr. Ibbetson, then President, in the name of the Society, placed in his hands the testimonial signed by every individual member, and thus concluded his eloquent and cordial address:-"In the course of a long life spent in the arduous and toilsome duties of your profession, you have gained for yourself a character of no ordinary kind—a reputation for extreme courtesy and kindness by your patients, and a reputation for urbanity and extreme ability by your professional brethren, who alone can be considered competent judges of this last qualification. Long may you live to be an honour to your profession. Long may you live to enjoy the honours which you have so justly earned, and of which we venture to hope that this scroll will be an enduring testimony; and hereafter, when death shall have closed the earthly career of those now present, and we shall all have passed away, it will be to generations yet unborn a gratifying proof of the worth and sterling qualities of him to whom it is offered, as well as a testimony of the esteem in which he was held by his professional brethren." Mr. Rogers was the author of the first paper read before the Odontological Society in February, 1857, at which time he was one of the Vice-Presidents. In 1859 he was elected President, and from 1861 to 1867 he undertook the duties of Treasurer. He was one of the first Examiners in Dental Surgery at the Royal College of Surgeons, and one of the founders and early supporters of the Dental Hospital and London School of Dental Surgery. blank left by Mr. Arnold Rogers's decease will not soon be filled up; nor will the pleasant associations connected with his memory be easily effaced from the minds of those who had the privilege of co-operating with him in these various public labours, and who followed his remains to their last restingplace with deep, unfeigned sorrow.

Mr. F. H. Thompson died in London, whilst on a visit, in the 56th year of his age. For many years he held a distinguished professional position in Glasgow. Being a man of great and versatile talent, artistic ability, and genial disposition, his loss was severely felt by a large circle of friends, whilst the scientific and literary institutions of the western metropolis of Scotland were deprived of a warm supporter, especially the Glasgow Philosophical Society, of which he was for several years President.

Mr. Thompson joined our Society in 1857, and always evinced a warm and cordial interest in all its proceedings, frequently regretting that distance prevented him from meeting his London brethren more frequently, and co-operating with them in advancing Dental Science. The latter desire he was enabled to accomplish most effectually in Edinburgh, for, on the formation of the Odonto-Chirurgical Society, he became the first President, and continued, though residing at a considerable distance, to give it his cordial support and assistance until his decease. The influence of his genial nature and of the friendly intercourse he fostered between the members, will long be felt. A feeling record on the minutes of that Society, and a sympathetic address of condolence to Mr. Thompson's widow, show the appreciation of his fellow members and office-bearers.

Shortly after the decease of Mr. Thompson, Edinburgh lost one of her most respected and distinguished citizens, in the demise of Mr. Robert Nasmyth, in the 79th year of his age. He was the oldest dental practitioner in Scotland, a man of European reputation, universally known, and much beloved by a large circle of literary and medical as well as private friends. He, for a period of more than fifty years, conducted a large and extensive practice with honour and credit, and upheld the status of a profession to which he most earnestly devoted a long life, and in the pursuit of which he gained a name, a fame, and a repute but rarely acquired in the paths of Medical Science.

From an excellent obituary notice which appeared in the "Edinburgh Medical Journal," I make the following extracts. "Mr. Nasmyth was born in the year 1792, and educated at the High School of Edinburgh, where he formed the friendship and acquaintance of many who became his friends and supporters during his long and successful career. In 1823 he was elected a Fellow of the Royal College of Surgeons of Edinburgh. Mr. Nasmyth was always of opinion that to whatever speciality a practitioner might devote himself, he should always be a qualified medical man. He was himself, therefore, as might have been expected, not only a skilful dentist, but an accomplished surgeon, and for long was the right-hand man at many of the operations of Wardrop, Liston, Syme, Ferguson, and other eminent men of the day." "Besides his appointment of Surgeon-Dentist to the present Royal Household, he held this office to their late Majesties George IV. and William IV., thus maintaining the same honourable position during the reign of three successive sovereigns." "Altogether, few men have left a reputation more widely known, or will be more affectionately remembered, than he to whose memory we feel this tribute of respect is justly due."

Mr. Robert Thomas Hulme died, at the comparatively early age of 54, at Felstead, in Essex, whither he had retired from London practice. He commenced his medical education at the London Hospital, and, as a pupil of Barclay and Heath, he subsequently prosecuted his studies in Dental Surgery. these gentlemen he owed much of the thoroughly practical knowledge of his profession as a Dental Surgeon which his life exemplified. As a lecturer, Mr. Hulme greatly excelled; and, as a man of science, his exertions were well known and appreciated, when he occupied the post of Lecturer on Comparative Anatomy at the Grosvenor-place School of Medicine. He was author of several works and translations, including "Lectures on Diseases of the Dental Periosteum," "Dental Materia Medica," "The Teeth in Health and Disease," and the wellknown edition of Berand's "Atlas of Surgical and Typographical Anatomy," &c.-("British Journal of Dental Science.")

For many years Mr. Hulme was an active and useful member of our Society, ever ready at the Council-board to give information on those scientific subjects with which he was so familiar. When he undertook the office of Curator to the Museum, it was with the full intention of fulfilling its duties with that care and attention his talents so well qualified him to give; but, very soon after his retirement, he was seized with paralysis, from which he never recovered, and departed leaving many friends to mourn his loss.

By the demise of Mr. William Robertson, of Birmingham, we have been deprived of another of our earliest members and Vice-presidents. Mr. Robertson lived to an advanced age, much honoured and respected by an extensive circle of friends. He combined sound professional knowledge with personal worth, and conducted his practice in a way to reflect credit on the profession he so ardently followed. Although living in comparative retirement for several years before his death, he continued to feel a warm interest in everything pertaining to the progress and welfare of our Society.

I have finally to record the death of Mr. H. R. Rowe, of

Preston, a young practitioner of great promise, whose decease took place at a very early age, when he had been but a few years in practice. From the testimony of those who knew him, Mr. Rowe was a man worthy of all esteem and confidence, and imbued with a spirit of professional zeal rare in one so young.

Gentlemen, I trust many years may elapse before another President will be called upon to perform so painful a duty as to record the death of so many members, nearly all of whom were well known to, and esteemed by us, and all distinguished through life for their professional rectitude and probity, and held in affectionate regard by their fellow-men.

I have now only to offer you my most sincere and heartfelt thanks for having placed me in the honourable position of President of the "Odontological Society of Great Britain," which I esteem the greatest distinction a dental practitioner can attain.

I cannot find words to express my feelings on this occasion, but, believe me, I shall ever remember with gratitude your kind co-operation with me during my year of office, in the advancement of the cause we all have so much at heart. There is one satisfaction I have in quitting your presidential chair, and that is, that I am to be succeeded by a gentleman so universally known and respected as Mr. Mummery, and one so well qualified to do honour to the position. I beg most cordially to say Adieu.

After the President had left the chair, Mr. Cattlin said he could not allow the Meeting to separate without offering the cordial thanks of the Society to the President and Executive for the valuable services they had rendered during the past year. All who had occupied similar posts of honour were fully aware that the duties of high offices could not be faithfully performed without self-sacrifice and anxiety. The President who now retires has well and worthily filled the chair, and they owed him a debt of gratitude for the able and impartial manner in which he had watched over the interests and directed the affairs of the Society.

The President returned his sincere thanks to the Society for the kind manner in which it had, through Mr. Cattlin, recognised his efforts to serve it during the past year. He announced that the next General Meeting would be special, for the purpose of considering the desirability of expelling a member; and that afterwards a paper would be read by Mr. Thomas Charters White, "On some Points in the Minute Anatomy of the Pulps of the Teeth."





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FROM PHOTO'S. by LOMBARDI. BRIGHTON.

GENERAL MONTHLY MEETING,

MADE SPECIAL BY BY-LAW.

Monday, February 6, 1871.

J. R. MUMMERY, Esq., President, in the Chair.

THE Minutes of the last Meeting were read and confirmed.

The following gentleman was elected a non-resident member of the Society:—

Mr. LEON GABLOUSK PLATT, Stirling, N B.

The following gentlemen, having signed the obligation book, were admitted members of the Society:—

Mr. John Henry C. E. Martin, Portsmouth.

Mr. WILLIAM GILL RANGER, M.R.C.S., &c., 4, Finsbury Square.

The following gentlemen were proposed as members of the Society:—

Mr. WILLIAM FRANKLIN HENRY, 197, Old Kent Road (Resident).

Mr. Charles Gaines, M.R.C.S., &c., 8, Edgar Buildings, Bath; and

Mr. RICHARD BROWN, 61, West Street, Tavistock (Non-resident).

The following presentations were announced:—

Library.—"The Dental Cosmos." By the Editors.

Museum.—An unusually large salivary calculus, enveloping the crowns and greater portion of the roots of the second upper

molar and wisdom teeth. Presented by Mr. Peter Lord Pavitt.

A set of artificial teeth in porcelain, reported to be about seventy years old. Presented by Mr. Tuck.

Gentlemen,—Whilst giving expression to my deep sense of the honour which you have conferred upon me in electing me to the distinguished post of President, I feel the heavy responsibility which the position entails. Occupied as this chair has been in past years by some of the most eminent men who ever represented our profession in this or any other country, I should feel oppressed by the fear of inefficiently fulfilling the duties of the office did I not feel assured of your kind forbearance and support. I hope I may be forgiven for briefly alluding to my own exceptional position. Having had no inconsiderable experience of provincial practice, and being strongly attached to botanical and natural history pursuits, it cost me a painful effort to exchange the purer air of the country for the cloudy canopy under which we labour who are "in populous city pent."

Nevertheless, the change from the professional isolation of the country to the fraternal intercourse afforded by London practice has amply compensated me for any pleasures I may have lost; and I shall ever cherish a grateful recollection of the kindly welcome I received from many of the most distinguished members of the London profession on my removal hither; and it is now most gratifying to me to have received this further proof of your confidence.

Keeping in view the principle that service is of greater importance than office, I enter upon these duties in the hope that I shall be able to fulfil them in the satisfactory manner which will be my earnest desire to realize.

When I recall to mind the many admirable addresses you have received from your successive Presidents, it is not an easy matter to say anything that is new; but, on this occasion, when our Society has completed its second septennial period, it appears a fitting time cursorily to review its early history and progress.

Through the energetic action and unselfish zeal of a number

of gentlemen occupying leading positions in London practice, the first step was taken towards elevating the general status of our profession by founding the Odontological Society. Their united influence resulted in the institution of the Dental Diploma of the Royal College of Surgeons; and the Dental Hospital and School, as a necessary means of education, were established.

Many districts formerly left to the tender mercies of empirics are now supplied with able practitioners, and thus the community at large reaps the fruit of their labours.

At about the same period, other gentlemen, animated by an equal desire to promote the advancement of the dental profession, made earnest efforts toward that end upon a somewhat different plan; and although our Society passed through what may be called a stormy transition period, that has happily passed away, and we are all now united in a common effort to afford mutual help and counsel, to diffuse professional knowledge, and to establish the practice of dental surgery on a sound basis.

During the fourteen years of its existence, our Society has grown steadily, and we have great cause to rejoice at the progress made, whilst we may reasonably hope for further advancement; and it may now in general terms be said that the Odontological Society fairly represents the dental practitioners of England. The interchange of thought has already borne valuable fruit, not only in breaking down the isolation which formerly existed, and bringing members into friendly intercourse, but also, as a necessary consequence, enriching the common store of knowledge by the comparison of their varied experience.

There is one subject to which I feel bound to make some allusion—the exclusion of professional politics from the general meetings of our Society.

Other channels exist for the full and free discussion of these topics, and I entertain a firm conviction that the unity of purpose and courtesy of expression which have thus far characterized our meetings would be imperilled by departing from a practice which has hitherto worked so well, and that our Association would be so broken up that its reconstruction would become an impossibility.

We heard with regret, at the close of the past session, that we had received but a small accession to our numbers; but it is an oft-observed fact, that if a tree bears little or no fruit in a given year, the crop in the following year is extraordinarily abundant; and I entertain the belief that we shall find our Society has, like the tree, been quietly gaining strength in the interval, which will make itself evident by the decision of many practitioners to offer themselves as members, who have only been thinking about joining us during the past year.

I earnestly hope we shall have cause to congratulate each other on such a result at the close of the present year.

It gives me much pleasure to announce that several scientific gentlemen have promised papers, in the course of the session, on subjects which cannot fail to be interesting to the Society; and I feel persuaded that our own members will not be wanting in their efforts to contribute their share towards the general interest of our meetings.

The President said he was reminded of the performance of a duty at once special and painful: it was a legacy left him by his respected predecessor, and, of course, he must carry it out. The object of the special meeting was to propose the expulsion of Mr. Edwin Lowe, late of George Street, Hanover Square. He did not know whether it was necessary to enter into any particulars. Most of the gentlemen present were aware of the grounds on which this action has been taken by the Council. He believed that he (Mr. Edwin Lowe) was now undergoing penal servitude. He thought this left their duty very plain. Some member should propose and another second that Mr. Edwin Lowe be expelled the Society. The motion could then be put to the Meeting in the ordinary manner.

Mr. Sercombe said, as a private member of the Society merely, and not as an office-bearer, he begged to propose the expulsion of Mr. Edwin Lowe. He was not willing to investigate private character too closely, but when any one so far forgot the duties of society as to commit acts which brought him under the cognizance of the police, and, subsequently, of a higher court, he felt the time had come when association with such a person must cease. He deeply regretted to think that

any one who had enjoyed the advantages of the education of a gentleman, and the professional status which Mr. Lowe had enjoyed, could be capable of such conduct as that for which Mr. Lowe was now suffering penal servitude. By lapse of time Mr. Lowe would cease to be a member of the Society, but he (Mr. Sercombe) felt this would not satisfy the members generally; he felt that such conduct could not be passed over in silence, and, therefore, though he performed the task with great pain, he would not shrink from proposing the expulsion of Mr. Edwin Lowe from the Society. This was the first occasion on which such a course had been found necessary, and he could not for a moment doubt it would be the only one in the annals of the Society.

Mr. J. C. Gibbons (Brighton) seconded the motion, which was put to the Meeting and carried.

Mr. Cattlin.—At the last meeting of the Society some forceps were exhibited (said to be taken from an American pattern) which had a sliding wedge between the handles, the object of the wedge being to prevent the application of unnecessary force to the crown or fangs of a tooth during the act of extraction. The design of the movable wedge seemed to have been taken from a pair of saw-edged forceps which he had introduced a few years ago, as shown by an engraving in Mr. Tomes' "Manual of Dental Surgery." He did not notice it at the time, but it had occurred to him since, that the wedge in the forceps which were exhibited was made of polished steel, and, therefore, was likely to slip during an operation, and, perhaps, so cause the very accident it was designed to prevent. If they examined those forceps, which had a wedge of the original pattern, they would find some very fine lines or teeth on the wedge, and also on the handle of the forceps, which antagonize so that the wedge could not slip when put in action. Should the sliding wedge ever be adapted (as he thought it might with advantage) to lithotomy or midwifery forceps, the mechanical arrangement he had alluded to would be of still greater importance.

Mr. Steele.—In illustration of the value of the nitrous

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oxide gas in general surgical operations of short duration, he had pleasure in mentioning a case which occurred only that afternoon at Croydon. A married lady, aged about twentyeight years, was operated upon for fistula by Mr. Paget. Lanchester had requested the attendance of Mr. Rymer or himself with the necessary apparatus for producing anæsthesia by nitrous oxide. Mr. Rymer, his partner, complied; and all being ready, he administered the gas from a Barth's bottle, through the usual bag and face-piece. Anæsthesia was produced in about sixty-five seconds, the word given to commence, and in about four minutes from the commencement of the gasinhalation the operation was successfully completed without pain. The face-piece was not removed during the continuance of the operation. At eighty seconds the gas was turned on again and inhaled for fifteen seconds, and so on alternately with the gas off and on at intervals of about fifteen seconds, until the completion of the operation. The rapidity of action, as well as the success in effect, in this case, were gratifying, and suggestive of a sphere of usefulness extending beyond the speciality of dental surgery.

On some Points in the Minute Anatomy of the Pulps of the Teeth. By Mr. T. Charters White, M.R.C.S., &c.

MR. PRESIDENT AND GENTLEMEN,-

Before commencing to read this simple communication, I feel that my apologies may be due to many for calling their attention to so rudimentary a subject, and one with which they are doubtless more familiar than I am; but I must confess that I have been working alone, without that intercourse with my professional brethren and that reading-up of the literature of the subject whereby I should have been made acquainted with what has been done so well by others; but having promised a paper giving the results of my independent researches in this branch of minute anatomy, I could not withdraw from that promise; and therefore, if what I lay before you may seem somewhat elementary, I trust to your leniency to accept the spirit willing to make itself useful, and to lightly criticise this, its first attempt amongst you.

We are all more or less familiar, either personally or by the experience of others, with the exceedingly painful sensation excited in cutting into the dentine during the process of excavation

for the purpose of stopping a tooth. It was with the view of ascertaining the agency by which these sensations were conveyed to the sensorium that, twelve years ago, I commenced an investigation into the minute anatomy of the pulp of a tooth and its connection with the dentine, the results of which investigation I have the privilege of laying before you this evening. Knowing that the fibres of the dental nerve distributed to the pulp were much too large to enter the tubuli of the dentine, I felt convinced that they could not be the sole channels of communication, but something else existed necessary to complete the connection, and I set myself the task of elucidating the obscurity that in my mind enshrouded this subject.

The histological elements concerned in the structure of a tooth are so well known that I need not refer to them, except by way of memorandum. We have the tooth covered with its dense armour of prismatic crystals of enamel overlying and protecting the dentine; then we see the dentine constituting the really vital as well as the main body of the tooth, with its myriads of tubuli, whose mouths open on to and help to make up the walls of the pulp-cavity; the tubuli radiate outwards, diminishing in size as they proceed, and at last inosculate with adjoining tubes to form an irregular system of loops. This is the element in the tooth to which I wish especially to call your

attention, because it is in this tissue that the sensitiveness alluded to manifests itself, and particularly in that part where the tubes form loops with each other.

It is seldom that the pulp of a permanent tooth can be examined, for obvious reasons; but, as the elements existing in a permanent tooth have their exact counterpart in the temporary teeth, and these being often removed in a sound condition, to make room for the regular growth of the second set, they can be obtained in sufficient numbers and in a state most suitable for microscopic investigation. The teeth chiefly used in these investigations have been the temporary canines, the pulps of the incisors generally presenting a semi-gelatinous state not favourable to their removal from the cavity of the tooth. The course of procedure adopted is as follows: a longitudinal groove being made round the tooth with a file, and the débris thoroughly washed away, the application of the cutting nippers to one end will split the tooth cleanly in two, and the pulp may then be withdrawn by firmly seizing it with dissecting forceps at that part where it enters the apex of the fang, and then, peeling it out of the pulpcavity so as to draw it away with all its attachments, it may be laid on a glass slide under the microscope, and examined with a half-inch objective.

I shall speak first of the appearances presented

by the pulp in this stage and before compression has been applied, because they come first in order, constituting, also, difficulties in the way of proper observation, and one at least involving a point of interest which at present remains unravelled. Upon placing a pulp under the microscope, we shall find in the majority of cases that it is full of air-bubbles, a perfect froth of them filling the interstices of either the areolar tissue of the pulp, or its vessels, I cannot definitely settle which, for in some instances it may, upon pressure being applied, be traced running in the course of the capillaries, in others occupying an irregular space among the meshes of the areolæ. It is not within the province of this paper to inquire from whence comes this air, but it is, nevertheless, a problem that I should be glad to have solved, as it is a barrier against the examination of many otherwise eligible pulps, which, but for its presence, would afford a satisfactory view of the distribution of the ultimate nerves of the pulp before it had undergone any compression. Thinking it probable that air might find an entrance and be absorbed through the foramen at the apex of the fang during the interval between the extraction and the examination, I have thrown the teeth immediately after extraction into water or glycerine; but still the air has been present, either having eluded my vigilance, or being in the tissues prior to the extraction; but, however it comes

there, its presence causes all the histological elements of the pulp to become lost in the froth that fills the tissue. Sometimes separate from, and sometimes in conjunction with, this obstacle to easy examination of the pulp, another will present itself in the shape of myriads of nodules of osseous deposit. These are the calcification islands of Salter. They are structureless masses of matter, resembling gum-arabic, of varying size and shape, the prevailing form being spindleshaped, with the long axis corresponding to that of the tooth. They are most abundantly supplied to the lowest portions of the pulp, but, nevertheless, by their thickness, they prevent that compression of the pulp necessary to make it thin enough for examination with the higher powers of the microscope.

But sometimes a pulp may be found free from the drawbacks just mentioned; and if it is examined by reflected light under the microscope, and with but very slight compression, we shall notice an appearance differing only in colour from that presented by a section of dentine taken transversely to the course of the dentinal tubuli; we shall see a number of round bodies, whose diameters would correspond to the conjoined diameters of the dentinal tubes and the walls immediately surrounding them. This is the view taken from looking at the ends of these bodies; and I will ask you to bear this first step in our investigations in remembrance, because this is an important point in understanding the relation of these bodies to the dentine covering them.

Now to gain an insight into the minute anatomy of the pulp, we must call in the aid of other agents in addition to the microscope, we shall have to apply to staining fluids and re-agents to enable us to discriminate between the various elements entering into the formation of it. It is not the object of this paper to treat of microscopical manipulation, or to enter into the description of the various colouring fluids that may be employed and a comparison of their several advantages, but I must here acknowledge the great assistance I have derived from the use of the ammoniacal solution of carmine used so successfully by Professor L. S. Beale in his researches. The formula for the preparation of this fluid may be found in his valuable book "How to Work with the Microscope," p. 201. This fluid has the property of staining all the living and growing parts of a tissue, while those that are formed are not affected by it: thus, in staining a tissue with this fluid by allowing it to soak in it for a few hours, and, after washing it in glycerine, examining it with the microscope, the nuclei of that tissue will be found stained a deep crimson, the nucleoli will be a darker red, while the surrounding structures will be almost colourless; thus making the active and living parts distinctly

manifest from those which are already formed and passive. The growing germ probably contains some acid element; it may be an abundant supply of oxygen, which precipitates within itself the carmine from its alkaline solution, the absence of which element in the formed material causing that structure to remain neutral.

If we place the pulp of a tooth into some of this solution, and allow it to remain for twentyfour hours, then, having thoroughly washed away the superfluous carmine solution, place it in glycerine under compression, we shall observe that the round bodies described as covering the external surface of the pulp are stained of a deep crimson; and the side aspect presented, in consequence of the pressure, will reveal that their form is oval; that they are stained so deeply is an evidence that they are not formed material, but that they have an office of a growing and active character. Upon seeing these, I named them "the germinal corpuscles," from the belief I entertained that they were the dentine-forming organs. They are the odontoblasts of the German histologists, to whose valuable and deep researches in this department of biology I wish to make no references on this occasion, but to give you simply what my own unaided investigations have afforded me the opportunity of seeing, that my evidence may be a corroboration of their work, should such be needed.

But to return to our subject. Upon further compression, some of these odontoblasts, or germinal corpuscles, will be made to start out from the ranks of the rest, and will then be seen to have a connection with the pulp by means of a very pale, slightly granular fibre running into and losing itself in the fibrous substance of the pulp. Upon carefully examining the distal extremity of the corpuscle, the remains of a similar fibre may be detected running in the direction of the dentinal tubuli; but these fibres are so hyaline that, unless great care is taken, they are liable to be overlooked. We shall notice now that the compression has rendered the course of the dental nerve slightly perceptible through the separated bodies of the corpuscles; but to bring it plainly into view the pulp must be placed in a very diluted solution of liquor sodæ and glycerine, when all the germinal corpuscles are dissolved away, and a clear unobstructed view of the course of the dental nerve is afforded. As this element of the pulp performs an important part in its minute anatomy, I will endeavour to give you a careful description of its course. It enters the foramen at the apex of the fang, in company with the vessels; at first it is a tolerably large bundle of fibres, and passes a short distance into the pulp without dividing; it may then be seen splitting into two or three smaller fasciculi, and each of these dividing again into smaller still, till at last

single pairs of fibres may be traced to all parts of the pulp. Now the course taken by these nervefibres is everywhere at right angles to the longitudinal axes of the germinal corpuscles, and therefore at right angles to the course of the dentinal tubes. This is another important point to bear in mind; it is a further evidence that the pain arising from contact with sensitive dentine cannot be conveyed by direct contact with the ultimate fibres of the dental nerve, but through some intermediary agent. The nerves and their terminations probably may end in loops, but I have found but few opportunities of confirming this supposition, the pressure necessary to render the pulp thin enough to see the nerves being sufficient to rupture the loops did they exist; and therefore, though pairs of nerves may be seen running together in one direction, and sufficiently isolated from the others to give the impression that they had been connected in their course, yet upon tracing them up to their termination their ends are found free, and only a faint indication exists to warrant the conclusion that probably they might have been joined together before compression.

The course of the artery when first it enters the tooth is straight and parallel with that of the nerve; but it soon branches off into a network of capillaries, and becomes distributed throughout the pulp, where, at the periphery, its branches run in close proximity to the bases of the germinal corpuscles.

Three kinds of nuclei or germinal matter, besides the corpuscles, are found in the pulp of the tooth stained by carmine. These are the fusiform nuclei of the areolar or connective tissue, the nuceli of the nerves, and the nuceli of the artery; these differ in their form and disposition, and therefore cannot by a careful observer be confounded one with another. The germinal corpuscles clothe the external surface of the pulp and stand closely side by side in a dense phalanx, and with their long axes at right angles to the surface on which they stand. The fusiform nuclei of the connective tissue are disposed in every conceivable direction, occupying the substance of the tissue, and are easily distinguishable by their spindle shape from the other nuclei. The nuclei of the artery are arranged transversely to the course of the vessel, and somewhat spirally, and occupy the muscular coat of the artery; these, again, are of a different form to the others, being of an elongated oval shape. Then we have the nuclei of the nerve-fibre occupying the substance of the nerve, and of an irregular longitudinal character. It is desirable that these differences be borne in mind in examining the preparations before you, lest the sight of so many coloured nuceli should engender confusion between them.

Now, having taken this brief glance at the

histological elements making up the body of the pulp, I will leave this part of the tooth and call to your mind an element in the dentine which, though of the tenuity of a cobweb, plays a very important part in the economy of that structure. I refer to the dentinal fibrillæ occupying the tubuli, and to which Mr. Tomes called attention some years ago. These fibrils are very transparent and of a semi-gelatinous character; they are so small that to see them well requires a moderately high power, and a very careful adjustment of the light to render them distinctly visible; but their existence may be easily demonstrated by decalcifying the section of a recent tooth, and tearing it transversely to the course of the dentinal tubes, when the fibres may be seen as a fringe along the fractured edge of the section projecting from the tubes. By a careful examination of the microscopical characters of these fibrillæ we shall be brought to recognize in them a relation to the fibres attached to the germinal corpuscles at the orifices of the dentinal tubes. These fibres are the organs around which they deposited the dentine; they retain a low kind of vitality, and are capable of inducing change in the structure they were the agents in forming, although in a slower manner than would take place in the other bony structures of the animal frame.

We see now that in the dentine an agency exists by which the vibrations of contact, whether of irritant fluids or of a steel instrument, can be transmitted to the pulp, but we have yet to learn how these dentinal fibrillæ, after passing through the germinal corpuscles, communicate with the dental nerve and its branches.

It is a matter of considerable difficulty to demonstrate in a satisfactory manner the method of this communication, and it is the solution of this point alone that has kept me back from publishing at an earlier period what I have done in these investigations. I felt that while it would be easy to imagine a connecting link, it would not be honest to do so, and I have endeavoured, by the use of every means, by re-agents of every kind within reach, to compass this difficulty, and see distinctly the union of the dentinal fibres with the nerve, but without success at present. If I might give a conjecture deducible from very fair grounds for my belief, and from a collation of the various aspects I have been enabled to make out in some hundreds of pulps examined, I should not be far from the truth were I to assert that these fibres, after leaving the bases of the germinal corpuscles, enter the fibrous tissue of the pulp and become fused in the outer coat of the nerve; but I would have you remember that it is only conjecture, after all, and that preparations in which this connection is demonstrated have to be yet worked out.

Having now briefly glanced at these elements in the dentine and in the pulp, we shall be in a position to comprehend the changes occurring in the pulp-cavity which make it desirable that in all cases of exposed pulp the treatment by escharotics should be limited to exceptional cases, and every endeavour made to save the pulp in its integrity. To do this the better, let us go back to an early period in the fœtal life of the dentine, when this tissue was represented by only a thin covering crowning the summit of the pulp; at this time the germinal corpuscles were at their most active stage of vitality, and probably they continued so, without much interruption, till the cavity, by increased deposition of dentine on its inner surface, was reduced to its usual calibre, when the osteogenetic powers of the pulp became dormant.

Now, as an illustration that these powers do not become defunct with the arrival of the pulp-cavity at the stage in which we are accustomed to see it, but only remain in abeyance, I need but point to the formation of the secondary dentine which occurs in the pulp when advancing caries, or any other source of irritation, wakes up the pulp to activity again. It is evident, upon an examination of the secondary dentine, that an agent governing the formation of the primary dentine has been in active but more irregular operation in the new structure, as the dentinal tubuli in the secondary dentine are continuous with those of the original tissue, but more irregular and tortuous in their character. The

formation of the secondary dentine takes place, I conceive, upon this plan: After the pulp-cavity has arrived at the usual size, the corpuscles remain in close contact with its walls and are dormant, but when any source of irritation wakes them up, they recede from the old dentine, and, taking upon themselves an active existence, deposit the secondary dentine, drawing it after them as they recede into the centre of the cavity.

By viewing the formation of the secondary dentine in this light, I think we are warranted in coming to the conclusion that in the pulp there exists an internal prolongation of the caudal appendages of the germinal corpuscles dipping down into the tissue of the pulp, while the external appendages, constituting the dentinal fibrils of Tomes, occupy and govern the dentinal tubuli.

If then this internal caudal appendage passes into and becomes fused with the dental nerve, we have an explanation of the method by which the pain arising from contact with the excavator is transmitted to the nerve; and if the view I have endeavoured to give you this evening, of the nature of the various elements in the tooth-pulp, commends itself to your intelligence, I am hopeful enough to believe more will yet be done to advance the interests of Conservative Dentistry than ever yet has been tried.

DISCUSSION.

The President said he would be happy to hear any remarks on the interesting paper they had just listened to. Mr. White had taken great pains with his subject, which possessed a considerable amount of practical interest, independent of its scientific value.

Mr. Coleman.—As a member of this Society he felt individually grateful to Mr. White for having brought this subject under their notice. It was one he had himself worked at for some years, not so many as Mr. White told us he had—about half the number, six probably—and chiefly with the same object in view, viz.: the attempt to discover some communication between the nerve-fibres which ramify within the dental pulp and the ivory cells of Kolliker, or odontoblasts. His preparations had been made chiefly from the teeth of the calf, or adult human teeth removed before the development of the fangs had been completed, such teeth, immediately upon removal, having been immersed in the staining fluid of Dr. Beale; and he might here remark that he had never experienced the trouble complained of by Mr. White from the access of air through the dental foramina. In some of the sections made from the teeth thus treated, especially in those obtained from the calf, he had had reason to believe that he could trace a distinct communication between the nerve fibres of the pulp and the odontoblasts or their cell-walls; but one was so apt to take up the microscope with preconceived notions, and the desire to see something in accordance therewith, that he regarded his conclusions upon the point in question with some distrust. Whilst the clear demonstration of communication between the nerve-fibres of the pulp and the dentinal cells would, no doubt, most satisfactorily explain the cause of sensitiveness in dentine, he did not consider it as absolutely

necessary for them to be able to trace, in all cases, a direct communication between fibre and sensitive part, before they could assume that impressions could be conducted from that part to a nervous centre—at least they did not insist upon this for the transmission of forces analogous to that they Impressions received by the long denominated nerve-force. process of the odontoblasts might be conducted from these bodies through the numerous cells which intervene between them and the nerve-fibres, or, possibly, the connective tissue of the pulp may perform this office. Connective tissue, some authorities inform us, has, in the early history of the individual, had a previous existence as nerve-tissue. regard to the odontoblasts themselves, he had been tempted to attribute to them a higher office than that which had commonly been assigned to them, viz., as organs more or less concerned in the development of the dentine. He was inclined to believe they might be regarded as comparable to the tactile corpuscles, the Pacinian bodies, the rods and cones of the retina, the terminations of the auditory nerve in the cochlea, &c. That all special sensations are received first through special organs appropriated to this office, before transmission along the nerve-fibres, is a view insisted upon by many leading physiologists. To the teeth is commonly assigned the one simple office of the mechanical division of food; but surely, if they had no other office to perform, they would not have been constructed the highly-sensitive members they found them. Teeth can exist and live without nerves or bloodvessels in their interior, for some such are found in ovarian tumours; but this endowment with sensitiveness was to impart to them, so to speak, an extreme delicacy of discernment, both as to whether the objects comminuted be suitable as food, and if the latter, when it is sufficiently divided, as to be incapable of injuring or irritating the delicate lining of the œsophagus and stomach. As an instance of the former, how speedily is detected—by the teeth—the smallest particle of cinder that has found its way into a freshly-baked biscuit or rusk, and yet both pulverize with much the same force and sound. A consideraation of the source from whence the teeth, the gums, the cheeks, lips, tongue, palate, &c., receive (in common language)

their power of sensation, with attention also to the source from whence the muscles of mastication receive their stimuli to action,—the former through the sensory, the latter chiefly through the motor, branches of the fifth pair of cranial nerves, would, he thought, give us more insight into the truly reflex process of mastication, and enable us to understand that which we have all witnessed and wondered at, viz., how (to take an extreme case), individuals having, perhaps, only two teeth in the head, and these meeting each other, can manage, as they will assure us, though in a longer time than is usual, to fairly comminute or masticate their food. That the teeth are endued with sensitiveness to enable them to fulfil functions such as he had described, he certainly believed, but how the sensations they receive are conveyed to their appreciating nerve-centres is another question; and that the odontoblasts are organs for the receptions of the sensation, is, he must fairly add, only a conjecture, perhaps he ought to say, only a speculation, upon his part. whole subject is surrounded with difficulties; for, even if they were able, readily, to trace distinct communication between the nerve-fibres of the pulp and the odontoblasts, and so explain the sensitiveness of dentine, they have those paradoxical cases to account for, which have been described by Mr. Salter in the "Archives of Dentistry," where sensitiveness is observed in portions of dentine distinctly cut off from all communication with the dental pulp, except through the fine lateral branches of the dentinal canals, with which as yet no prolongations from the long processes of the odontoblasts have been discovered; also cases of more common occurrence, described in this room by Mr. T. A. Rogers, and which he had himself several times met with, viz.: where the fang of a tooth, carefully cleared of its canal contents previous to grafting, has, on scraping its interior, given evidence of extreme sensitiveness. In the latter cases, no doubt, they could explain the fact by supposing the sensations to be conveyed along the processes of the odontoblasts to the nerves of the periosteum.

Mr. C. Tomes.—It is, of course, impossible to arrive at a just conclusion respecting observations after hearing them for the first time, more particularly without carefully studying

the preparations from which they have been drawn. But one or two difficulties occurred to him, which hindered his acceptance of the views set forth by Mr. White and by Mr. Coleman. White explains the sensibility of the dentine somewhat after this manner: the soft dentinal fibrils are continuous with, are, in fact, processes of, the odontoblasts, and he has traced processes from the inner ends of the odontoblasts in continuity with the nerve-sheaths in the pulp. Now this does not prove that they have anything to with sensation, for many structures are connected with the sheaths of nerves, which are merely connective tissue and have no special function, and Mr. White does not appear to have traced out a connection with the nervefibres themselves. Moreover, the application of re-agents enables us to trace the nerve-fibres in the pulp further than Mr. White makes mention of. A similar objection applies to Mr. Coleman's supposition, that the odontoblasts may serve as sensory organs, like tactile corpuscles in other parts of the body. Their very imperfect knowledge of the relations between structure and function only enabled them to speak positively of the function of a special structure when they could see its close connection with structures the functions of which are well known. Now no connection had been shown to exist between the odontoblast and the nerve-fibril; hence it appeared to him that these speculations on its possessing a sensory function are a little premature, and too far in advance of a solid foundation of fact.

Mr. White said, in reply to Mr. Coleman, he had before now been placed in a dilemma to give a satisfactory reason for pulpless teeth being sensitive, but he thought Mr. Coleman overlooked the fact that the periosteum being largely supplied by nerves derived from the same source as those which supplied the pulp, and the periosteal surface of the fang being perforated by numberless minute channels, nerve-filaments might enter from the external nerve-supply, and so transmit the sensation as easily as through the more direct agency of the nerve-fibres of the pulp. In reply to Mr. Tomes, he begged to thank him for drawing his attention to a slip in his Physiology. In the hurry of writing his paper, he had said the internal process of

the odontoblast became fused with the *sheath* of the nerve, he should have written it became fused with the nerve-fibre.

The President said the points raised in the discussion were of a highly suggestive character. It was a taunt often brought against the microscopist, that he could see anything he liked when examining an object through a high power. He knew well, from the experience of past years, the difficulties attending these studies. It was quite possible to see an object, either as a fibre or as a tube, according to the previous conception in the observer's mind. The direction in which the light fell, the thickness of the object, and the variations in the penetrating power of the objective, would all tend to produce different impressions upon the minds of the several observers. could not, therefore, wonder that the gentlemen who had spoken should not exactly agree upon some points. He should have been rather surprised if they had. It was by discussions like those that they arrived at something like truth, and he hoped they might even yet have this delicate and difficult subject worked out at a future day. The observation that Mr. Coleman had made on the intelligence of teeth struck him as a new and an interesting idea. Did the teeth really learn to discriminate in doing their work? He should have attributed this function to the tongue and the mucous lining of the mouth; but it was really a most interesting and curious point, and one well deserving their attention. He was glad that Mr. White had again returned amongst them. He had done good work in other branches of microscopical labour, and in the light he strove to throw upon these difficult points, certain practical matters were involved well worthy of consideration. He begged to offer the thanks of the Society to Mr. White for his valuable paper. Also to the contributors to the Society's Library and Museum. He hoped the Curator would be able to identify the teeth embedded in the Salivary Calculus presented to the Society; for his own part he doubted either of them being a third molar.







ORDINARY MONTHLY MEETING,

Monday, March 6, 1871.

JOHN R. MUMMERY, Esq., PRESIDENT, IN THE CHAIR.

THE Minutes of the last Meeting were read and confirmed.

Mr. W. George Beers, of Montreal, Canada, was elected a Corresponding Member of the Society.

The following donations to the Museum were announced:—

Jaws of a ray. Presented by Mr. Sercombe.

Shark's teeth, illustrating the principal forms found in tertiary gravel near Walton-on-the-Naze. Presented by Mr. Tomes.

Skull of a cat (adult). Presented by Mr. Bennett.

Skull of a pig, in which some of the deciduous teeth remain. Presented by Mr. Bennett.

Mr. Marsh had much pleasure in presenting to the Society a small specimen of gemination which had occurred between the second molar and wisdom teeth on the right side upper jaw. He had been unable to obtain the history of the case, as the dentist who had extracted the teeth was dead, and had left no record of it.

Mr. Fox read the following note:—

"15, Bold-street, Warrington, February 13th, 1871.

"C. J. Fox, Esq.,

"I have enclosed some pieces of a filling which I think you will find will not fail in any case, and will bear a favourable comparison with gold, and is much better than any cement

in use at the present time. I shall be obliged if you will introduce it at the Odontological Society's Meeting for me, so that those members who wish can try and report on it. If more be wanted I will send it. It is made of equal weights of calcined silica, ground under water to an impalpable powder, and picked gum copal, ground slowly under very slight pressure to prevent heating and adhesion. When the copal is as fine as flour the silica is slowly added, and they are ground together for some time, and afterwards heated over boiling water until they fuse into a mass. It requires to be worked hot, like gutta-percha, and to be used quickly. If the surface is kept rough it can be built up to any form, and after condensing must be filed and polished. You will find it as hard as gold, and, as far as I have tested it, quite as unchangeable. It will take a very fine polish, and appears to repay well the trouble of learning its peculiarities. I will send samples of $\frac{1}{4}$ oz. to any one for one shilling's worth of stamps, until the thing is thoroughly tested, and it can then be seen if it is worth the expense to any of the dental depôts to get the necessary machinery to make it. I can only make small quantities. If any of the members of the Odontological Society wish for any, I will forward it to them free. It has the special advantage of being almost a perfect non-conductor of heat, and being apparently quite unchanged in the mouth for this reason. The copal wears off the surface slowly, and leaves a finely polished surface of silica. If you are not very quick in condensing it, and afterwards condense round the edges well with a hot instrument, you will find a difficulty "Faithfully yours, with it.

"THOS. FLETCHER.

"P.S.—I enclose a sample of the same filling with the silica in double proportion to the copal. It is rather easier to work, but they both require to be worked in a similar way to pellets of adhesive gold, using a gum wad slightly moistened with glycerine at the point of the instrument."

Mr. Sercombe asked Mr. Fox how long Mr. Fletcher had had the cement in use. Every one in the habit of working in the mouth knew that time alone could show whether any given material was of value or not. Some cements which promised to be everything they desired had turned out to be worse than valueless. If the cement had been used, say for three or four years, and had realized all Mr. Fletcher's expectations, then undoubtedly the Society would be greatly indebted to him for having made them acquainted with so valuable a compound. Every one would be only too thankful to escape from the fatiguing operation of gold-filling if he could do so, but he much feared whether anything would be found to take the place of gold. The material, as exhibited in the teeth sent round, looked very well, but it was one thing to examine it under such circumstances and another after it had been in the mouth some time. He thought they could not do less than promise to see how far it was a useful compound.

The President thought that, although this ingenious preparation might serve as an excellent temporary stopping, it was a bold assertion to state that it was equal to gold for permanent stopping, and he feared it would prove wholly inadequate to resist friction if employed for the grinding surface of a tooth.

Mr. C. J. Fox did not know how long Mr. Fletcher had tested the cement; all he knew of the matter was contained in the note he had read.

The President inquired of Mr. C. S. Tomes whether he had examined the teeth embedded in salivary calculus, presented to the Museum at the last meeting, with reference to the doubt expressed as to one being a bicuspid and not a wi-dom tooth.

Mr. Tomes said he had examined the specimen referred to by the President as closely as he was able without destroying it, and he had no doubt in his own mind that the two teeth were a second molar and a wisdom tooth.

Mr. Sercombe wished to draw attention to the application of the rubber coffer dam, and to ask members whether they had used it in the operating-room, and with what results. Also whether they had found difficulties arise in its use, what means they had taken to overcome those difficulties, and whether it had proved as valuable as its inventor believed it

would. He had himself used it, and was more than pleased with it. He had seen it employed on a recent occasion at the Dental Hospital, and supposed, therefore, that it was appreciated by that Hospital's staff.

Mr. LAWRENCE VANDERPANT said it so happened that within the last few hours he had been attempting to use the rubber dam, and he must candidly confess, though he had had it in use for some months, he found the greatest possible difficulty in practically applying it; but he doubted not that failure arose from ignorance of the proper means of manipulating it. His plan was to cut off a portion of the rubber several times larger than the tooth to be operated on, and, by means of a hot wire or other instrument, burn a hole therein; then stretch it over the tooth, and secure it thereon by a silk knot. He might mention, while on the subject, a plan he had adopted with very fair success in the case of a youthful patient for whom he desired to plug a lower molar with gold. An extraordinary flow of saliva occurred—in fact, he compared it to the rising of the tide, it was perfectly uncontrollable,—to obviate which he took in gutta-percha a model of the side of the mouth to be operated on; after immersing the model in cold water until hard, he removed it from the tray, and with a hot knife he cut a properly-shaped hole in the gutta-percha above the carious tooth, which he exposed sufficiently to operate on, and then readjusted the model to the mouth. But there was no question that the simple means of which Mr. Sercombe spoke was preferable to any other known, and he was sure the Society would listen with much interest to a description of the manner he used and applied the rubber.

Mr. Cartwright had not used the rubber dam, but, à propos to the subject, he might say that he had just received a letter from his son, who was now in New York for the purpose of acquiring information respecting the practice of our American professional brethren, in which he said, "I cannot conceive how you can get on without the rubber dam, so much can be done with it." His son was staying in Dr. Kingsley's house, and he, Mr. Cartwright, might take this opportunity to express his

warm appreciation of Dr. Kingsley's kindness, not merely in receiving his son, a stranger to him, into his house, but for showing him all he could, and doing all in his power to further the views with which his son went to America. It proved a disposition to kindly acts and willingness on the part of our trans-Atlantic brethren to freely communicate professional knowledge.

Mr. Coleman had first witnessed the application of the rubber dam at the hands of Mr. Collins, formerly a pupil at the Dental Hospital, shortly after the return of that gentleman from a visit to America. It appeared extremely useful in those cases where much time was required in the process of packing the gold, especially in the use of adhesive gold, where small pieces were introduced at a time, and where it was absolutely necessary to prevent the access of the slightest moisture to the cavity of the tooth. The difficulty in its employment appeared in cases where the teeth were very close together, when the rubber was, in the attempt to apply it, generally torn. But it was, nevertheless, a very useful and ingenious contrivance. With reference to the remarks which had fallen from Mr. Cartwright respecting the willingness of their American brethren to impart to them any of the many ingenious devices which had originated in their country or among themselves, he could bear witness to the truly professional spirit in which all the American dentists he had had the pleasure of meeting had made the knowledge they possessed common property amongst the profession here.

Mr. Gregson observed that the rubber dam had been used many times at the Dental Hospital by two American gentlemen, one a professor at Harvard Hospital. They used a piece of rubber about twelve inches square; pierced a hole with a blunt instrument, and then stretched it tightly over the tooth. But it always seemed to him that it could only be properly fixed when it could be got between teeth, such as single teeth that were a little apart. The rubber covered the whole of the mouth, and there seemed to be some difficulty as to the patient's breathing. He had only tried the dam once or twice, and had not been very successful with it.

Mr. Charles Tomes had had the pleasure of seeing the rubber dam applied by an American gentleman to whom it was of especial importance to keep the cavity very dry, as he was in the habit of using sponge gold exclusively. He used a large sheet of rubber, a foot square or more, cutting holes in it near to one margin for three or four contiguous teeth; then, supposing he were about to fill the second lower molar, he would cut holes for the wisdom and first molar teeth, and possibly also for the second bicuspid. Having slipped the rubber over the teeth, three or four strands of floss silk twisted together were passed between the teeth so as to carry it well down to the gum. He laid particular stress on the necessity of turning down the edge of the rubber, which embraces the necks of the teeth, by passing a blunt-pointed instrument around them, and was careful to leave a sufficient width outside the holes to secure the edge of the sheet of rubber rising above the level of the duct of the parotid. It was necessary to lay a towel on the patient's chest, as the saliva was very apt to run down from the corners of the mouth; and this was a feature in the use of rubber dam to which English patients might often object. The rubber dam could seldom, he believed, be advantageously used where it would not stay on after having been carefully applied in the manner described.

Mr. Coleman.—How were the holes in the rubber made?

Mr. C. Tomes.—By folding the rubber and cutting off the apex of the fold with scissors. He had omitted to say that it was possible to apply the rubber wherever a few strands of silk would pass between the crowns of the teeth.

Mr. Sercombe was very glad that he had brought this matter forward. He felt at the last meeting that enough time had elapsed since this invention had been introduced by Dr. Barnum to enable them to discuss its merits. In America it appeared not to be considered *infra dignitatem* for dentists of the highest standing to patent their inventions; but Dr. Barnum had not in this instance done so, and he (Mr. Sercombe) thought they, who had always set their face against patents

should be the first to hail this high-spirited action on the part of Dr. Barnum. His own impression was that they scarcely knew the full value of this invention. When they considered that in all the various forms of stopping and various kinds of gold employed the exclusion of moisture from the cavity was most important, the value of such an invention became apparent; the advocates for filling teeth with nonadhesive gold would be more satisfied if there were no moisture. Where adhesive gold was used moisture was absolutely inadmissible. His experience was that where the teeth were very short, and where from the edge of the gum to the grinding surface of the tooth the crown was an inclined plane, the difficulty of holding the rubber dam was very great. In cases where the teeth were very closely packed he took some coarse floss silk and endeavoured to work it down between the teeth; if he could succeed in this he could apply the rubber dam. There were some simple and efficient contrivances for passing the silk between the teeth which, when the mouth was very small, were of value; he had employed with satisfaction one introduced by Dr. Isaiah Forbes. He could quite understand Mr. Cartwright junr.'s surprise at their being at all able to stop teeth without the rubber dam. He had not used it for a very long period, probably in 200 or 300 cases; but his experience seemed to be greater than that of gentlemen present. He now rarely attempted to stop a tooth without using it. Two days ago he had a case which illustrated the enormous value of the rubber dam—he had to plug a lower molar. The flow of saliva was simply overwhelming, so that he could hardly see to cut out the cavity. Having at last done so he put on the rubber dam, and worked at the tooth for an hour and a half, during the whole of which time it was absolutely dry. He, Mr. S., could give no more lucid description of the method of using the dam than that given by Mr. Tomes. He did not find that people objected to a napkin folded two or three times under their chin, and he might say that in some of his operations two or three napkins had been required to receive the saliva that had flowed out from under the rubber dam. He could not conceive that an operator, having once taken it up, could

do without it. He knew it was objected to by some people on account of its peculiar smell; but he thought that objection might easily be overcome, and a rubber introduced free of smell: it would certainly add much to the value of the invention if such a rubber could be made. He thought it very desirable that the holes should be cleanly cut, the rubber would then be less likely to tear; for this purpose he had two punches, one for molar and the other for bicuspids, canines, and incisors. In answer to one inquirer, he would say, if he had to stop a first lower molar, for example, in a mouth in which the other teeth were present, he should include the second molar and the bicuspids in the dam. In those cases where a tooth stood alone it was very useful. He found it always most difficult to give an intelligent description of his mode of proceeding. He thought they would gain a great deal if they could occasionally vary their meetings by a practical demonstration. Before sitting down he wished to express to Dr. Barnum his deep appreciation of the enormous value of his simple suggestion. It was natural enough that American practitioners, when they came to England, should visit the Dental Hospital as the supposed centre of dental work here. He thought, as that Hospital emanated from this Society for two purposesfor the good of the public, and the good of the profession—that when such gentlemen came to England their personal acquaintance should not be limited to the staff of the Hospital, but that the members of the Society should be informed of their presence. Only lately he had learned that two out of some of those of his American brethren whom he desired to see, and to see whom he even contemplated a journey across the Atlantic, had come and gone before he had known that they had been here. He did not know whether in this matter he spoke the feelings of other members of Society.

Mr. Hutchinson (a pupil of the Hospital) exhibited a pair of forceps for the removal of much-decayed lower molars; they were referred to by Mr. Fox in the following paper:—

A few Words on the Extraction of Teeth. By Charles James Fox, M.R.C.S., L.D.S.

MR. PRESIDENT AND GENTLEMEN,

As amputation has been called the opprobrium of surgery, so, perhaps, extraction may be considered the opprobrium of dentistry—the last resource of the dentist's skill—in fact, a confession of failure; failure, notwithstanding all the resources of science to preserve for use, during our brief span of life, one of those little organs, the retention of which is so essential to the comfort, if not to the duration, of that life. Whether it be from the feeling that extraction is such an opprobrium to us, or that from its frequent use or abuse by ignorant, unqualified men, it is deemed a practice unworthy of serious consideration by the learned and scientific followers of our profession, who consider their time more wisely and usefully employed in the study of the principles of conservative dentistry, I know not; but certain it is, that although this Society has now existed fourteen years, we have never yet had a paper upon the very simple but allimportant subject of the extraction of teeth. There may be yet another reason, and I am inclined to believe it is the true one, viz., that the talented author of our present system of extraction, in his work on "Dental Physiology and Surgery," has explained the whole matter, though briefly, yet so clearly and definitely, as to leave but little more to be said on the subject.

Although Mr. Snell, in his work on "Operations on the Teeth," published in 1831, when giving an interesting summary of the history of forceps, speaks of the necessity of having instruments adapted for the removal of each particular tooth, and describes four pairs, depicting those fitted to the upper and lower molar, yet I cannot but call Mr. Tomes the author of our present system, because it was only under his directions in 1841 that regular sets of extracting forceps were made by Mr. Evrard, adapted to the exigencies of each case, and so accurately adapted to the shape of the teeth as to need no finishing touch at the hands of the dentist; but although, as I have just said, Mr. Tomes has left but little further to be said upon this matter, I cannot but feel that it may be useful after such a lapse of time for us to compare notes upon the subject, and I have, therefore, adopted it as the text of my Paper on this occasion, in the hope that, as the dull flint by contact with the brighter steel elicits brilliant sparks of light, so my brief remarks may, under your sharp criticism, be made to elicit some items of knowledge, the result of your greater experience and observation, which may be useful to us all. It is not my intention to weary you with a long

paper, entering into all the details of the anatomical arrangement of the teeth in their respective sockets, nor to pass regularly in review the great variety of instruments and the method of applying them to the different teeth, matters with which you are all well familiar; but I shall take up one or two simple points of practice in which I seem to fancy that I differ from some of my brethren, so that you can point out to me wherein I am in error, or support me by the confirmation of your own experience.

Until lately I had but little opportunity of comparing my practice with that of others, but the introduction of nitrous oxide brought to my rooms, before its use became so general, many brother practitioners, to whose patients I administered gas whilst they operated; and as one of the staff of the Dental Hospital of London I have frequent opportunities of witnessing the operations of some of the advanced students, whose dexterity and success I cannot but admire, although I frequently find their manipulation different to that which I should myself adopt. But I conclude that they are following the instructions of their other teachers, my colleagues, from whose expressions of opinion on this occasion I trust that, in common with others, I may benefit.

Before going further I had better, perhaps, mention one or two rules which regulate my own method of practice.

In the first place, I never in any case of extraction leave the right side of my patient, except in the case of removing the lower left wisdom tooth with the elevator, and often not then, simply turning the head of the patient sideways to the chair.

Secondly, I commence to operate on every tooth as if it were sure to break, or likely to prove difficult of extraction; in other words, I adopt extreme measures at first, proceeding as slowly and cautiously as if I had to operate a second time after an accident, bearing in mind the remark made, I believe, by the late Durancé George, "Better be a minute extracting a tooth than a second in breaking it."

A third rule is, never to "pull out" a tooth, but simply to "remove" it.

And a fourth, never to lose sight of a tooth from the moment the forceps are placed upon it until it is finally removed.

A fifth valuable rule mentioned by Mr. Tomes is, "push the jaw of your forceps into the sockets as though you intended they should come out at the top of the head or under the chin."

But I say in addition, keep moving the tooth inwards and outwards all the time you are pushing home the instrument.

Of course I am well aware that there is no rule without an exception, but I think that those who have witnessed my operations, will admit

that the above is my almost invariable rule of practice.

It is difficult to make a paper like this intelligible without practical demonstrations or well-executed diagrams, and these latter I have not had time to provide, having from circumstances been requested to write this paper at a very short notice, and being indebted to the ready pencil of my pupil, Mr. Bruce, for the hastily executed sketches before you.

In reference to my first rule, I would point to the almost invariable practice of removing lower left molars and bicuspids with hawk's-bill forceps from the left side. I confess I can never reconcile myself to this mode of practice, although it is one of very old standing; it appears to me to result to a great extent in a direct outward, with very little upward, motion of the tooth, and consequent extreme strain upon the external wall of the alveolus; in fact, it seems to me very similar to the action of the key, minus the bruising or support to the alveolus rendered by the bolster. This is one of the questions I should like to hear discussed.

It is true, as I said before, that in the hands of powerful, cool, and skilful young men, I have seen this operation performed with marvellous celerity, but I cannot divest myself of the impression that there must be greater suffering in the external wall of the alveolus than would result from a more gradual removal, substituting, it is true, a longer period of suffering during the extraction for the suffering after extraction. On the other hand, where this method of removing the lower molars has been adopted by less powerful and less skilful hands, fracture of the tooth has often been the inevitable result, and that so low down as to make the subsequent removal of the roots a matter of no little difficulty.

Before the introduction of nitrous oxide, the instrument I here show you, one of American pattern, I used with complete success for the six lower molars, always standing on the right side of my patient. At first some little practice is required to attain the use of it, as it is necessary to turn the wrist well round to obtain the requisite mastery of the instrument. Mr. Vasey, some years ago, was so pleased with the principle of the instrument when I showed it to him, that he at once had some lower root forceps made by Mr. Evrard on the same plan. You will see that whilst using this instrument my rule of never losing sight of the tooth I am extracting may be easily carried out. The presence of the prop when operating on a patient under the influence of nitrous oxide rendered the use of this instrument somewhat difficult, and in such cases I now invariably make use of a pair which were originally intended only for lower wisdoms, or, as a last resource, in the case of a broken-off crown, preferring, according to my second rule, especially with nitrous oxide, to adopt extreme measures from the first.

I have said that one of my principles is, never to "pull out" a tooth, but simply to "remove" it; and I think I can safely say that I never broke a tooth without tracing the accident to a breach of this rule. It is not easy, when suddenly called upon before such an assembly as this, to detail your mode of operation—to define exactly how you do it; but I think I may define my manner of extracting, unscientific though it may sound, rather as a general shake of the whole tooth, than as any definite determinate pressure in any one way. If I follow any rule at all, it is to press inwards first, against the strongest wall of the alveolus, thus tending to separate the tooth from the weaker external wall, according to the advice given by Mr. Tomes. In the upper incisors I prefer to give half a turn each way, with a slight backward and forward motion; but whatever course of motion I give, I make sure that the tooth is well loose in its socket before I attempt to remove it. This is especially applicable to the upper teeth, and particularly to the case of a broken-down crown with the three roots still united; for such a case I prefer a pair of wide, long-jawed, upper root forceps, with a slightly movable joint, grasping the palatine and one of the buccal fangs. I push up all the time I am endeavouring to dislocate the tooth, carefully avoiding all traction until the tooth is thoroughly loosened in its socket. In this way I have often succeeded in removing what have appeared to be hopelessly broken-down fangs. For such cases I have seen the forceps combined from various patterns by Mr. Bailey, and shown at a recent meeting, used with great success.

For the extraction of upper wisdom teeth I have never seen a pair of forceps so well curved for the purpose as those made by Evrard. When these teeth grow out much to the cheek, I have found it a good plan, directly I have introduced the forceps into the mouth, with one jaw of the instrument resting against the cheek, to tell patients quickly to close the mouth; they cannot do this entirely, but yet do it sufficiently to cause that relaxation of the buccinator without which it would be difficult to get at the tooth. The upper bicuspids I have generally found prove to be the most fragile and deceptive of all the teeth we have to deal with; they are most frequently the subject of that little depression in the centre of the fangs, into which, as Mr. Vasey pointed out to me in the earlier days of my practice, a firm nodule of alveolus is fixed, acting with all the power of the small side-screw in a sockethandled instrument. All the pulling in the world will not get that tooth out, until you have so far loosened it and enlarged its socket by various motions that the nodule can be fairly passed.

The canines, too, are often subject to the same impediment, but I know no case that is more likely to baulk a careless operator than the first upper bicuspid roots, when not fully divided by caries. I find it the best plan to remove the buccal fang, in such a case, with the elevator, and the lingual with the forceps; any attempt to remove them together will probably result in the collapse of both. The mention of the elevator brings me to the lower wisdom tooth, in which case I would only use it where I thought the forceps inadmissible; as, for instance, where much of the crown had disappeared, or the position of the whole tooth was particularly eccentric.

I am by no means a strong advocate for the use of this instrument, always preferring to use the forceps where possible, and not unfrequently dislodging a wisdom tooth with the elevator, and removing it with a pair of root forceps, rather than have recourse to the repeated digs which I have sometimes seen administered.

I know there are some who pride themselves on their dexterous use of the elevator, with which they say they can remove almost any root or tooth. It is very well to be able to do this in a case of emergency, but I am quite sure that the habitual pursuit of this practice is attended with much needless suffering to their patients. The method of using the elevator is another point upon which I hope to hear some expression of

opinion. I believe that some use the outer edge of the alveolus as a fulcrum, and endeavour literally to dig up the offending root. I have always myself preferred to use a small thin spearshaped instrument, and, letting it glide down close to the approximal surface of the tooth to be extracted, endeavour to insert it between that tooth and the septum which lies between it and its neighbour; by thus avoiding direct pressure on the second molar, and giving the instrument a half turn, the wisdom tooth is easily dislodged.

I have not unfrequently been successful in removing a lower left wisdom by standing at the right side of the patient, and, with a pair of lower bicuspid forceps, grasping the tooth from the anterior external to the interior posterior corner. By this means I have been enabled, in cases where there was strong suspicion of the fang taking a direct backward turn, to give the tooth such a rotatory backward motion as to remove it with the greatest facility. With regard to the lower incisors, cuspids and biscuspids, I invariably use the lower root forceps, still standing at the right side of my patient.

I see that Taft, at page 345 of his "Operative Dentistry," advocates a very similar course. Indeed, in his "general remarks" on the extraction of the teeth, he very strongly supports my views in favour of slow operations. He observes:—

"The movement in the extraction of a tooth should always be very deliberate—never sudden and violent. A very good criterion in regard to the rapidity of movement is, that the eye should follow and distinctly recognize every motion of the forceps, the tooth, and the contiguous parts."

And in another part he says:-

"The manner of performing the operation is an important consideration; it should not be precipitate or hurried. A very good criterion is, that the eye should critically follow and the mind attentively comprehend every movement of the hand and instrument. It is a very common method to seize the tooth, turn away or shut the eyes, and make the most rapid motions possible, regardless of consequences. Accidents, such as breaking the tooth, fracturing the alveolus, laceration of the soft parts, and rupture of the bloodvessels, are very likely to follow a hurried extraction; and there are many cases on record, in which injury has resulted from a rapid application of force to the extraction of teeth.

There is much that is interesting and instructive on this subject to be found in his work, although he is not so clearly definite and concise in his instructions as Mr. Tomes, in his "Dental Physiology and Surgery."

An interesting paragraph will be found at p. 329 of Taft, pointing out the peculiarities of certain teeth, as indicating the degree of facility with

which they may be removed. This is a subject which might easily be more fully worked out, and I would suggest it to some of our younger members as an interesting and practically useful field of investigation. One familiar instance occurs to my mind, viz., what are commonly called honeycombed first molars; the same causes which brought about the arrest of development of the enamel on the crown will be generally found to have caused an equal arrest of development in the fangs, thereby rendering them an easy prey to the forceps.

There are other points treated by Mr. Taft with which I do not agree, nor do I think that many will on this side of the Atlantic. For instance, his advocacy for free-lancing of the gums prior to all cases of extraction. He says,—"In all cases the gum should be separated from the tooth as far as the embrace of the forceps is to extend." This seems to me a needless addition to the discomfort, not to say pain, of our patients, and I shall hope to hear a definite expression of opinion on this subject to-night. Meanwhile I find the following pertinent observation upon this subject in a little manual on "Extracting Teeth," by Dr. Robertson, of Philadelphia, U.S.:—"It produces a great deal of unnecessary pain. With many patients, the dread of having the gums lanced is greater than that of having the tooth extracted. Many timid and nervous patients can, by great effort, bring themselves to bear the infliction of one pain, but cannot a second. So it is no uncommon thing for such a one to submit to having a gum lanced, and then go away without having the tooth extracted; but who would gladly have had it out if it could have been done at once, as it should have been." The writer concludes, "Have a gum lancet, then; let it be a good, plain, practical instrument, but use it seldom."

I observe with regret a growing tendency to have forceps made large, thick, and heavy, after the American fashion, and I cannot help contrasting those of the present day unfavourably with such as those supplied to me twenty-one years ago by Mr. Evrard. It may sound to some an idle boast, but I can assure you I never in my life broke a pair of forceps; and yet one of this very set, a favourite lower root forceps, was broken the other day by one of our powerful-handed young operators, which would seem to me an argument against the use of powerful direct force in one direction: happily in this case the instrument broke, but it might have been the tooth. Mr. Evrard can bear me out in the statement that he has never had any other of my forceps to repair, and I am quite sure no one else has.

The use of nitrous oxide has introduced, I fear, a rage for rapid extraction, with a view to performing many at one administration of gas, which I fear must sometimes result in considerable

destruction of the adjacent tissues. I think it is open to question whether it is wise or prudent to make too many extractions at one sitting. Mr. Clover, in the last number of the British Journal of Dental Science, very justly remarks, with regard to wholesale extractions, "that there can be no doubt about the desirability of leaving the mouth in such a condition that food can be taken without great pain."

The argument is sometimes advanced that the patient residing at a distance perhaps can only come to town on such and such an occasion, and insists on its all being done at once; but would such an argument be held admissible by any surgeon who deemed it right to perform a series of small operations on any other part of the body? The removal of a tooth is looked upon as such a comparatively trivial matter that we lose sight of the aggregate of suffering caused by the removal of some twelve or eighteen at a time, and forget that, if there were a similar extent of lacerated surface on any other part of the body, say on the leg for instance, the patient would probably lie up in bed for a fortnight.

There is another point in connection with nitrous oxide to which I would desire to draw the attention, especially of my younger friends, and that is, that, as the administration of nitrous oxide as an anæsthetic is, comparatively speaking, a matter of life and death, in which the admini-

strator is solely responsible for the result, his convenience must be consulted prior to that of the operator, and his view of what is the right and proper position for the safety of the patient must be consulted, to the exclusion, if necessary, of the comfort of the operator; at any rate, in such a case as the extraction of teeth, from which as a rule no evil results can follow. It only requires a little practice and careful selection of his instruments for a dentist to operate in almost any position. Before the introduction of nitrous oxide I had heard that the recumbent was the most favourable position for a patient to inhale chloroform; and although with some inconvenience to myself at first, both Mr. Clover and Mr. Bailey will bear me out in my statement that, for many years past, I have operated when they have administered chloroform, and made many extractions during one inhalation, often kneeling by the side of a patient extended flat on a sofa; and to this I attribute the rapidity and comfort of my patients' recovery in most cases, and the almost entire absence of the much-complained of sickness. So with nitrous oxide, there is one position which more than any other conduces to the safety and comfort of the patient, and that is, the nearly erect posture, with the head well supported forward.

It is the one point that Colton insisted upon more strongly than almost any other, and it is to the great disregard of this in England that I cannot but attribute the difference lately reported between the effects of nitrous oxide as witnessed here and when administered by Colton, who, in his 25,000 cases, does not appear to have had so many with unpleasing results as we had here in some few thousands, according to recent statements.

I can safely say that in my own private experience the difference has been most marked between those cases where the head has been well thrown forward, and where I have allowed it to droop backward, either during inhalation or at the moment of operation.

We are not here now to enter upon the subject of nitrous oxide; therefore I will beg you to assume for a moment that my view, or rather Colton's, that the head must be thrown forward, is correct; and let us see whether it is impossible to operate equally well in that position; indeed, in many cases I am inclined to maintain that it is better. I may, perhaps, be speaking with prejudice; for I have for so long a time accustomed myself to operate in this position that I infinitely prefer it to any other, whether it is a question of gas or not. It seems to me that with the head thrown back, the operator's arm raised, as I have often seen it, to the level of his head, there is great loss of power, and, to a looker-on, a very unpleasing exhibition of brute force. Far back as you may put patients' heads, they will, when conscious, go further back still; and surely, therefore, it is better to begin at the minimum.

An examination of the angles of your instruments will show that they are adapted to removal of the teeth when the head is in the erect position. I am inclined to fancy that this extreme throwing back of the head is a modern innovation, for one of our principal anæsthetists told me the other day that one of our most experienced operators always followed the plan I am now advocating. fact," he observed, tapping the falling head-piece of my chair, "I don't think he has got such a thing as this all over his house." I may not mention names, but I do hope if there is any one present who follows this practice that he will say so. I may mention, en passant, that I believe many of the alarming cases we have heard of as taking place during the administration of nitrous oxide may be attributed to mechanical and preventible causes.

One of the greatest dangers arising from throwing the head back, when extracting roots under nitrous oxide, is, that they may fall into the mouth and pass over the dorsum of the tongue unperceived. I witnessed one case, when I administered the gas, in which I vainly endeavoured to arrest the work of the operator by pointing out the rapidly disappearing root, nor could he be convinced of its disappearance that

way until the patient appeared with it the next day, stating that she had happily coughed it up in the night. I merely mention this to show how, with the head in that position, such an accident may occur even to an operator pre-eminently skilled and careful as this gentleman is.

While on the subject of nitrous oxide I may allude once more to those forceps for the removal of lower molars. A great essential to success, in removing a number of teeth under one administration of nitrous oxide, is the ability to do with as few instruments as possible, so as to avoid the time lost in changing them. With one pair of forceps which I am in the habit of using you could remove all the six lower molars, were it so necessary, and with it and a pair of lower root forceps every tooth and root in the lower jaw could be readily removed.

For general use in the upper jaw I have never found any instrument so universally useful as these wide-jawed upper root forceps. I hope it will be distinctly understood that I by no means advocate making the patient suffer by the use of inefficient instruments for the sake of showing with how few instruments you can accomplish your work. I merely mention them as an indication of my opinion as to which instruments I find the most useful when time is an object.

Another subject which, although not new, has lately somewhat prominently occupied our atten-

tion, is one that I hope will be touched upon to-night. I allude to the cutting forceps for the division of the roots of teeth. I cannot say that I have found much need for them, but certainly in one case that came under my notice, in which my colleague, Mr. Moon, used them with success, I believe that without them the roots would not have been extracted. The case was a very interesting one of a fistulous opening in the lower jaws of two years' standing—the result of a neglected lower right molar root. Nothing was left but the near apex of the two fangs, exodosed together and buried so deeply in the alveolus that it seemed impossible to dislodge them with forceps or elevator; and it was only when Mr. Moon divided them with the cutting forceps, that he ultimately very skilfully removed them.

While on this subject I ought not to omit allusion to the cutting forceps devised by Mr. Harding. Two instruments, on directly opposite principles to what we have been accustomed to consider correct, have also been devised by Messrs. Hutchinson and Mordaunt Stevens.

I have not tried Mr. Stevens's forceps, but have applied those of Mr. Hutchinson, and I cannot but think that in many cases they would prove most serviceable, effecting at one extraction the removal of two nearly separated roots, which would inevitably have come apart in the grasp of any other instrument.

I must not now encroach further on the time allotted for discussion, but leave my Paper in your hands, thanking you for your kind attention, and begging you to remember that I have not attempted to treat the subject in its entirety, but have simply endeavoured to present a few practical points to your notice, in the hope of inducing a discussion which cannot fail to prove of value and interest, not only to ourselves, but to our patients.

Mr. Fox said,—Before sitting down permit me, Mr. President, to express to you my personal thanks for the clear and definite statement you made in your opening address respecting the exclusion of politics from our discussions; and as I fear that recent events have led my fellow members to believe that I desire to introduce the elements of discord, permit me to place on record my assurance that I entirely concur in the views you expressed. Accident led me to read a paper which I certainly thought at first might have been discussed without the introduction of party feelings long since happily defunct; the event proved that I was mistaken, and had I been consulted I should have been the first to accede to the request to waive discussion. I value the Society too highly, and am too anxious really to serve it, ever to wish to run the risk of provoking disunion.

The President expressed his satisfaction at the remarks of Mr. Fox with reference to the political question, and was glad to find the position he had taken up in his inaugural address so promptly accepted.

The President was sure every member would be gratified at the reference that had been made to the talent and courtesy shown by their American brethren who had visited London, and their willingness to communicate their knowledge and experience. It was but due that this recognition of their kindly feeling should have been made. With regard to particular modes of combating the flow of the saliva, and more especially that of the rubber dam, there could be no doubt that, if the difficulties which arise in the case of closely impacted teeth could be got over, it would become much more valuable than it now appeared to be. By the comparison of experience great progress might be made in the employment of this method. There was much worthy of consideration in what Mr. Sercombe had said with reference to demonstrations. The eye learns far more quickly than the ear, and we more clearly appreciate and remember what we have seen than what we have heard. As the time for closing the meeting had arrived, unless it was the wish of the members that it should be prolonged, the discussion on Mr. Fox's paper must be deferred till the next meeting. As it was a subject on which a great variety of opinion must be expressed, he thought it very desirable that they should postpone the question. He would take that opportunity of thanking Mr. Fox more than formally for coming to the rescue at the last moment. A paper had been submitted to the Council which they presumed would have been read on that evening, but on the Secretary examining it, a few days ago, he found it to be of too elementary a character to permit its being read, - an opinion in which he entirely agreed. It was highly to Mr. Fox's credit that on so short a notice he had come forward and given them so suggestive a paper. He trusted that at the next meeting it would be most thoroughly discussed. He felt bound to recur to a subject on which they had heard some appropriate remarksthe full and free spirit of communication which actuated their American brethren who had visited the Hospital. It was matter for regret that the Society, as a Society, did not know more of these gentlemen. Mr. Sercombe had mentioned the subject, and it was not one lightly to be passed over. If the staff of the Hospital would kindly communicate with the Officers and Council of the Society when such gentlemen were in London, they would be able to compare notes of their experience, and be able to show their appreciation of their brotherly feeling.

The meeting then adjourned.





ORDINARY MONTHLY MEETING,

Monday, April 3, 1871.

JOHN R. MUMMERY, Esq., PRESIDENT, IN THE CHAIR.

THE Minutes of the last Meeting were read and confirmed.

The following gentleman was proposed as a Resident Member of the Society:—

Mr. Thomas Edgelow, M.R.C.S., 25, Mount Street, Grosvenor Square.

The following gentleman signed the Obligation Book and was admitted a Member of the Society:—

Mr. John S. Cobb, Great Yarmouth.

The following gentlemen were elected Members of the Society:—

Mr. RICHARD BROWN, West Street, Tavistock.

Mr. Charles Gaines, M.R.C.S., Edgar Buildings, Bath (Non-Resident).

Mr. WILLIAM FRANKLIN HENRY, Old Kent Road (Resident).

The President having invited casual communications—

Mr. Coleman said he had been requested to bring under the notice of the society a very ingenious apparatus contrived by Mr. Stevens, the dental house surgeon at the hospital. The object of this contrivance, as all must clearly see, was to provide a means of illuminating the mouth of the patient on those dark days which so frequently occur in London, and which they had especially witnessed during the past winter season. The main object Mr. Stevens had in view was to spare the

patient on such an occasion from an extreme glare of light. (Mr. Coleman then made one or two remarks explanatory of the action of the illuminator, which to the audience, with the instrument before them, were perfectly clear, but which, if transcribed, would be unintelligible.) Mr. Stevens had taken very great pains in bringing this apparatus to perfection, and though he (Mr. C.) was not an advocate for prolonging the hours of work, yet he could confidently say that the instrument was as perfect as any such apparatus could be; for it threw a good light on the object to be illuminated without distressing the patient or dazzling the operator. Mr. Coleman then placed a gentleman in a chair and showed the use of the illuminator.

The President thought this illuminator would prove decidedly valuable. An eminent brother practitioner, seeing that he (the President) had an adjustable gas-light, remarked on it as implying that he was ready at any unseasonable hour to see a patient—saying that he had nothing of the kind himself, and made no provision for working after daylight had passed away. There was a great deal of practical wisdom in the remark, but he must say, knowing the difference between the winter daylight in London and in the country, and the gloomy atmosphere surrounding them, there was, unfortunately, many a day when they wanted to attend to their practice and found that they could not. Then the use of artificial light became imperative, and he thought the present was the most convenient arrangement of light for the purpose intended that had been brought under their notice, and they were greatly indebted to Mr. Stevens for having so ingeniously worked it out.

Mr. Lawrence Vanderpant said that, with their usual courtesy, Messrs. Ash & Sons had complied with his suggestion, and had sent for exhibition the two instruments now before the President,—"Kirby's Automaton Mallet Pluggers." He had had an instrument similar to the simpler of the two in use for nearly two years, and he had no hesitation in recommending it as a very valuable implement. With it a very solid plug could be effected with half the ordinary labour necessary by manual pressure. It had the advantage over the ordinary mallet that

an operator could dispense with the services of an assistant. He had submitted several patients respectively to the application of the instruments known as Foote's, Snow & Lewis's, and that which was before the Meeting. In every case the latter instrument was preferred, as being productive of much less disagreeable sensations to the patient than the others; besid which it did not tend to fatigue, and, as it were, numb the fingers of the operator, as he had found to be the case with other instruments. Its action might be compared to that of "riveting," and the speed with which it accomplished its work was surprising. Any fault that might be found with the instrument at first would arise from want of experience in its use, but he was satisfied a thorough acquaintance with it would secure it a good reputation. He thought great improvements were necessary in the "bits"—that he believed was the technical term. He had been obliged to have them constructed in his own laboratory. The instrument had been exhibited about two years since in a modified form by its inventor, Mr. Kirby, of Bedford.

Mr. HARDING thought the necessity for the mallet had been done away with by the introduction of the rubber dam, for when it was used the two hands were free to use the ordinary mallet. He would ask Mr. Sercombe whether he had used the rubber dam when filling with osteo-plastic. Members had no doubt found that these fillings gave way at the necks of teeth, in consequence of the mucus collected at that point. This was entirely obviated now by the rubber dam—the stopping, when it was used, remaining as hard as the specimen attached to the manufacturer's card-box. Drs. Moffat and Hawes, from Harvard University, were at the Dental Hospital six months ago, and showed the application of the rubber dam. It had been used at the Hospital before that, but they explained it very clearly and carefully, and since that time it had been used almost invariably on his day (Friday), and he supposed also on the other days. The difficulties of its application were easily overcome by any one who would take the trouble to go into the matter.

Mr. LAWRENCE VANDERPANT said he thought Mr. Harding misapprehended the use of the instrument he had introduced to the notice of the Society. He would ask him what amount of hand-pressure would be requisite to rivet a head on a piece of wire? He would maintain that it was practically impossible to rivet with such pressure, and yet with the lightest possible hammer it was a work of the greatest ease. He compared the action of this instrument to that of the riveting hammer.

The Secretary then read the following communication from Mr. Balkwill.

"TO THE SECRETARY OF THE ODONTOLOGICAL SOCIETY.

"13, PRINCESS SQUARE, PLYMOUTH, "March 29th, 1871.

"DEAR SIR,—I enclose models and drawings of a method for pivoting front teeth, which I think is new, for the Meeting of the Odontological Society, next Monday evening. If it is a new method, I wish to present the models to the museum; if not, will you kindly return them to me?

"The stump is prepared in the following manner:—A hole is drilled up the centre as deep as can safely be done, and a screw thread is then tapped in this hole. This is done by using two drills to be presently described. A chamber is now made on the face of the stump, with flat-headed burr-drills, rather less than the eighth of an inch in depth, and as large as possible without endangering the strength of the walls of the cavity. After carefully washing out all the débris and drying the hole, screw up a gold tube which has a screw cut on its outside, and which is long enough to line the whole length of the hole bored, and stands up in the centre of the cavity made by the burr-drill, so as to be level with the top of the stump. will thus be formed a circular ditch between the gold tube and the sides of the stump, which is to be filled with gold-foil as in an ordinary stopping. Before screwing up the gold tube, in order to make the joint perfectly water-tight, smear it with a very little white lead and oil. A mineral tooth is now to be fitted in the ordinary way, and mounted on a split pin. It will require no other fastening, and can be removed at pleasure.

"This plan has occurred to me from the annoyance I have experienced from time to time by alveolar abscess supervening the pivoting of a tooth; or from the tooth becoming loose in consequence of the progress of decay. I think this method will meet both these difficulties. If abscess threatens, the artificial tooth can be readily removed and remedies applied; the hole that receives the pin of the tooth will not gradually enlarge by decay; and the stump being protected from the action of moisture by the tube and stopping, is rendered much more durable.

"The gold tube is made by winding a thin ribbon of plate spirally round the same sized wire as it is intended to use for mounting the mineral tooth upon. The seam is then soldered up, and a screw is cut on the outside of the tube. The square end of a steel drill should be driven into one end of the tube with a light tap of a hammer; this will make four slight indentations in the inside, which will give sufficient hold for the operator with the same drill to screw it into its place.

"The two drills which are used to bore the hole have first a screw cut on them with the same hole on the screw-plate as that through which the gold tube is passed. The one to be used first is then filed until the screw marks are scarcely visible. Both are then hardened and sharpened, and are ready for use.

"I remain, yours truly,
"F. H. BALKWILL."

Mr. Fox presented to the Museum of the Society, on behalf of Mr. Bellaby, of Nottingham, a specimen of an upper first molar with an exceedingly curious union of the fangs.

Mr. Fox also handed in a communication from Mr. Fletcher, of Warrington, explanatory of his new filling, which Mr. Fletcher feared, from the Report in the Society's Transactions, had not been clearly understood.

The letter was as follows:-

"The filling is a mixture of two parts of silica ground to an impalpable powder, and one of gum copal. It requires to be broken into pieces which are small enough to go into the cavity,

and afterwards to be condensed with a hot smooth instrument, which is kept slightly moistened with oil to prevent adhesion. It can be built up to any form, and afterwards filed to shape, the edges carefully condensed with a warm instrument, and the surface polished. The easiest way to keep the instrument slightly oily is to have at hand a gun wad, or small piece of felt soaked in oil, on which it can be occasionally rubbed. It is in some cases better to soften the pieces of filling over a flame before inserting them in the cavity; but they must be inserted and condensed very quickly, as they become hard as stone in two or three seconds if not kept hot. This sudden hardening is one difficulty which it requires practice to overcome. I have used the filling for about three months in all positions, and the only case in which I have seen the slightest change in it is in the first filling I made with it, which was not properly condensed. It is not intended to replace gold, and I did not wish any one to suppose so; but it is, so far as I have seen, a good cement, and more trustworthy than any other we have, approaching the colour of the teeth. The copal wears slowly off the surface of the compound, leaving a surface of silica as smooth as glass, which appears unchangeable. I shall be glad to send a small quantity to any one who will try it carefully and report on it. If more is wanted, the process of making has been published, and no doubt the depôts will take the matter up."

The President now called upon Mr. Cattlin to read his paper promised for the evening, saying that, as it bore upon the subject of that read by Mr. Fox at the last meeting, he thought it would be desirable that it should be read at once, and that the discussion on the two papers should be taken together.

Mr. Cattlin then read the following paper.

On Some of the Difficulties and Accidents which happen in the Practice of Dental Surgery. By Mr. W. A. N. CATTLIN, F.R.C.S.

Mr. PRESIDENT AND GENTLEMEN,

THROUGH the kindness of Professor Cartwright and Mr. Tomes (who have liberally given me the unrestricted use of their valuable Museums), I am enabled to place before you a very rare collection of deformed and diseased human teeth. "By hook and by crook," nature has entered strong protests against the unsurgical practice of dislocating one osseous organ from another. Even disease hurls defiance at our art, and seems to mock us when we attempt to pluck from the alveoli a "rooted sorrow." Plates 1, 2, 3, 4, and 5 exhibit various examples of malformation and disease; and although, since the introduction of well-adapted forceps, and other improved instruments for extraction, the frightful accidents which frequently happened during the dark ages of dental surgery have grown "by degrees" less frequent, I verily believe that Æsculapius and Tubal Cain together could not devise a safe and ready means of extracting some of these forms of distorted teeth.

Drawings of new instruments which Mr. Evrard, Mr. Mordaunt Stevens, Mr. Harding, Mr. Hutchinson, and other ingenious inventors, have contrived to overcome the difficulties occasioned by broken upper and lower molars, with some of special kinds, which Mr. Cartwright, Mr. Coleman, and myself, have found practically useful in preventing accidents, will be described hereafter in their suitable places.

It would be impossible, in the course of a short paper of this description, to give other than a sketch of some of the more important difficulties and accidents which have come within my own knowledge. Many subjects must necessarily be left unnoticed; still I hope the practical facts and observations which I propose to bring before you may not be wholly unacceptable to the Society.

Sometimes the crown of a bicuspid, or permanent canine tooth, will pass out of the alveolus, by an abscess or serous cyst, before the deciduous teeth have been shed; and occasionally the crown of a bicuspid tooth will be so firmly fixed between the roots of a milk molar, that the latter cannot be extracted without also removing the former. Drawings of the crowns of teeth which have been lost in this way may be seen in Plate V., and they seem to warn us not to extract the milk molars, without due cause, before the age at which the bicuspids should be fully formed.

There are a variety of circumstances which

are apt to create mechanical difficulties in our operations, and which may be guarded against by a careful examination of the parts before an operation is commenced. Overhanging of the adjoining teeth, or the projection of a strong amalgam stopping, may cause a sound tooth to be loosened or brought away with a disease done in the act of extraction. In such cases, the accident would be prevented if the sides of the diseased tooth, or the projecting part of the stopping, were well filed away before the operation was performed.

It is possible to prevent the fracture of a very much decayed tooth, or fang, by stuffing the cavity with gutta-percha, or some other soft stopping, and allowing the material to harden before the forceps is applied. The weak walls of a single root may occasionally be plugged with hickory wood sufficiently well to prevent its being broken during an operation.

I cannot better illustrate the importance of making a careful examination before a diagnosis is formed than by quoting the following case, in which the peculiar position of a wisdom-tooth must otherwise have escaped notice, and might have occasioned death by ulceration into the carotid artery. Some years ago a poor woman, whose health had suffered from bad drainage and imperfect nutrition, applied for my advice at the Islington Dispensary. The jaws were closed, but, by extending the cheek, deep phagedenic ulcera-

tion could be seen near the angle of the mouth, passing as far backwards as the eye could reach. The breath was very fœtid, and the general health of the patient was in a low condition. I at once determined forcibly to separate the teeth with the mouth speculum; and, upon making a careful examination, pus was seen to ooze from fistulous openings near the tonsil, which was surrounded by deep ulceration. A probe, passed through one of these openings, detected the presence of a wisdom-tooth above the tonsil, the crown of which pointed towards the throat. The fistulæ were divided, and a sound tooth (fig. 1)

removed through the opening with an elevator.

Fig. 1.



The first and second left lower molars being diseased, and loose from inflammation, were also extracted, chloride of zinc was freely applied to the ulcers, and the patient was sent to St. Bartholomew's Hospital, where

she had the benefit of generous diet, and ultimately recovered. Twelve years afterwards I had an opportunity of showing this patient to the members of the Odontological Society, having a mass of cicatrices corresponding with the course which the ulceration had taken.*

^{*} Vide "British Journal of Dental Science," vol. ii. p. 382; and "Transactions of Odontological Society," vol. ii. p. 93.

Perhaps it will be most convenient first to point out the difficulties which are met with in the operations on each tooth in the order of their arrangement in the maxillæ, commencing with the posterior teeth, and then to pass on to other subjects.

The dentist will occasionally be called upon to remove the wisdom-teeth from all kinds of irregular positions. I have myself removed them from the outer side of the maxilla, in very similar positions to that represented in fig. 2,

which is taken from a wax model in Mr. Cartwright's museum, and of which Mr. Barrett has favoured me with the following history. He says:—

"The case happened in the practice of the late Mr. Craigie about fifteen years ago. I re-





member the patient (a gratis one) attributed the malposition of this wisdom tooth to malpractice in removing the second molar, with which (as he said) a considerable portion of the alveolar process came away. The man was about twenty-five when I saw him, very nervous about himself, and, fearing the operation, had delayed it until the crown of the wisdom-tooth was fully through

the cheek. A small oozing of saliva escaped from a fine aperture in the mucous membrane around the neck of the tooth, and margin of the cheekaperture. After the extraction of the tooth, the aperture in the cheek closed entirely without any surgical aid."

Although the teeth, in the cases I have referred to as occurring to myself, had not passed through the skin of the cheek, they had caused fistulous openings in the face by their malposition. such cases it is useless to attempt to heal the fistulæ until the malplaced or diseased teeth have been extracted. In one patient, on whom I lately operated, the varied practice which it may be necessary to adopt in treating the opposite sides of the jaw in the same individual, when there is not room for the wisdom-teeth, was well exemplified. The periosteum of a lower wisdomtooth on the left side had been attacked by acute inflammation, which terminated in abscess. When I saw this case, a chronic abscess extended along the side of the jaw as far forward as the first molar. The movements of the jaw were restricted, and the abscess threatened to burst outside the face. Although only one cusp could be seen above the gum, I removed the tooth with the elevator. About a year afterwards, the same patient consulted me for slight inflammation of the periosteum of the lower wisdom-tooth on the right side. The inflammation was not sufficient

at this time to warrant surgical interference; but knowing the pain this lady had previously endured from the like cause on the opposite side of the jaw, I recommended her to have the condition watched by a dental surgeon in London, and she mentioned the name of Mr. Cartwright as the gentleman whom she wished to consult. I therefore wrote to him respecting the case, and we agreed that the immediate extraction of the first lower molar (which was decayed) would relieve the crowding, and probably prevent the inflammation of the wisdom-tooth from extending to the soft parts, as it had done on the left side. This operation was accordingly performed, with the result anticipated.

It is possible some may think the sound second molar on the left side ought to have been extracted in the former attack, to relieve the similar crowding on that side; but, in my opinion, that would not have been good practice—first, because this second molar was a very valuable tooth, and secondly, because the periosteum of the left wisdom-tooth was hopelessly disorganized when I first saw the patient, and would have kept up a state of chronic inflammation as long as it remained in the jaw.

Fracture of the Tuberosity of the Superior Maxilla is an accident which has happened to most dentists of large practice. It generally occurs when the elevator is used for the extraction of the

third upper molar in some case of exceptional difficulty. I here present to you drawings of two examples of accidents occurring from this cause; and the history of each case indicates the necessity of great caution whenever the elevator is applied in this situation.

Fig. 3, A, shows the tuberosity of the jaw attached to an upper third molar. The buccal side of the tooth, B, is much decayed, and the forceps could not have been applied without danger of fracture, or of one blade of the instrument slipping into the cavity and pressing upon the exposed sensitive pulp.

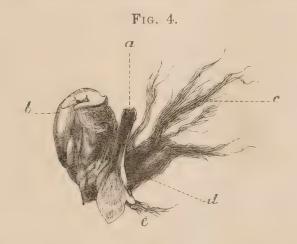
Fig. 3.



To avoid either of these contingencies I determined to use "Tomes's grooved elevator," and to prise the tooth up with great care; but, unfortunately, just as I was about to extract it, the patient seized the instrument with a jerk, and suddenly threw the head backwards. The tuberosity of the bone was in consequence broken off. I then grasped it with Assalini's tenaculum, and dissected it from very tough adhesions with a bistoury and probe-pointed scissors. The physician who attended the patient afterwards

informed me that she made a slow recovery, and suffered from pyæmia.

Fig. 4 is a correct drawing of the most severe accident of this kind which has ever come to my knowledge. The case did not occur in my own practice, but I can thoroughly rely upon the correctness of the details which have been given me. They are confirmed by the appearance of the preparation itself, which you will now have an opportunity of examining. The gentleman who operated in this case had the misfortune to break off the crown of the tooth, and in endeavouring to



a, Hamular process; b, broken third molar; c, part of the external Pterygoid muscle; d, Pterygoid fossa; e, part of the internal Pterygoid muscle.

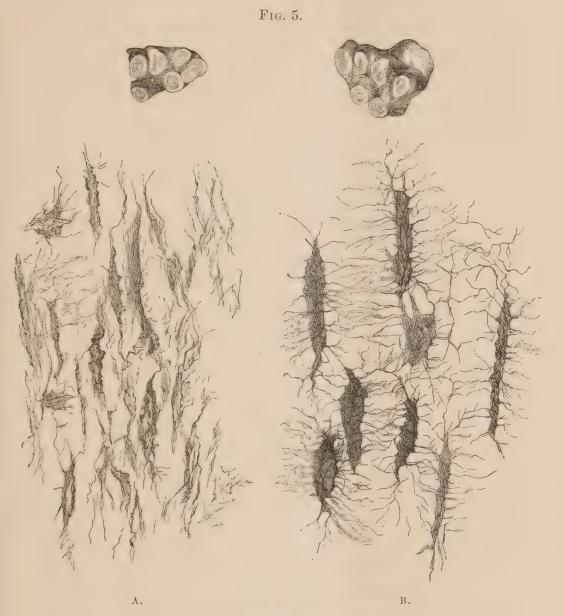
extract the roots with the elevator, the instrument slipped too low down in the alveolus and broke away the tuberosity of the maxilla with part of the floor of the antrum and a portion of the sphenoid bone. In the efforts which were afterwards made to remove the fractured portion of the bone with a pair of stump forceps, the tooth and

the hamular process were also separated, and fibres of the external and internal pterygoid muscles were torn away, and may now be seen attached to the pterygoid plates. The ultimate results of this accident were that the patient, after suffering in health for some time, became perfectly deaf on the injured side, and the movements of the jaw were permanently restricted. The inflammation had undoubtedly extended into the Eustachian tube, and also involved the ligaments and muscles attached to the inferior maxilla.

When such accidents as the foregoing occur, instead of forcibly tearing away the fractured portion of bone, as was done in the latter case, it should be grasped firmly by suitable forceps, and carefully dissected from the soft parts. Should inflammation afterwards arise in the throat or surrounding tissues, it must be subdued by leeches, fomentations, and purgatives, and the powers of the patient must subsequently be supported by generous diet, tonics, and, if possible, country air.

If the inflammation should extend to the epiglottis, it will be necessary to caution the patient against taking large draughts of liquid of any kind, as fluids, under such circumstances, have been known to pass into the larynx and produce suffocation.

Fig. 5 represents the second and third upper molars embedded in a mass of very soft bone of peculiar structure, from which a fluid resembling neat's-foot oil flowed, after a transverse section of it had been made with a fine saw. The mass



A, Microscopic section of soft alveolar process, taken from fig. 5, showing absence of canaliculi; B, Microscopic section of healthy alveolar process, taken from Dr. Bowerbank's section, showing canaliculi.

came away when I was in the act of extracting the second molar with forceps; and, if memory serves me, very little force was employed. No inflammatory symptoms followed, and the patient made a good recovery.

I do not remember to have seen bone in a similar condition. My friend Dr. Bowerbank (whose reputation as a microscopist is world-wide) has favoured me with the following remarks upon it. He says:—

"I have carefully examined, both in water and in Canada balsam, the bone within and without the teeth. Both of them agree in their structural peculiarities to such an extent that the cuttings from the two parts cannot be distinguished from each other. The bone cells are of about the usual proportions in regard to size and number, and their mode of disposition is the same as in healthy bone; but there is one peculiarity which is common to both the hard and the soft portions—and that is an almost total absence of the canaliculi of the bone cells (fig. 5, A). Rudiments of them were frequently observed on the surfaces of the bone cells, but none of the abundant ramifications that are usually seen emanating from the healthy cells. I have found among my own sections of human teeth a fine specimen of one having bone structure developed on its outer surface; but in this specimen the bone cells have the usual abundant development of the canaliculi" (fig. 5, B).

Figure 6 represents part of the floor of the

antrum attached to the fangs of a first upper molar. I am not aware that more than ordinary force was applied when that tooth was extracted by the forceps; on the contrary, it was what we should call an "easy case," and no unusual symptoms followed the operation. The bone adherent to the fangs is nearly as thin as paper.

Fig. 6.





Part of the floor of the autrum attached to the fangs of a molar tooth.

I watched the subject of this and the former accident for several weeks, and it may be taken for granted that inflammation of the lining membrane of the antrum was not produced in either case. In accidents similar to the above, if meddlesome surgery be not practised, nature will generally fill up such vacancies by osseous deposit.

Figure 7 is taken from a photograph of a first

Fig. 7.



upper molar in Mr. Tomes's collection. There

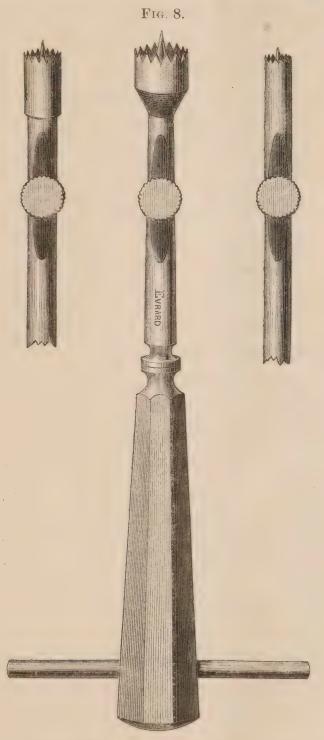
is a thick deposit of cementum around the diverging fangs of this molar, and a small tooth is embedded in a layer of hard osseous tissue at the side. Such a tooth (and a large variety of others of different shapes) could not readily be extracted.

Whenever unusual resistance is offered by teeth immediately below the floor of the antrum, in my opinion it is better practice to trephine away the outer plate of the alveolus, and to draw them through the opening so made, than to run the risk of fracturing the floor. In large antra the floor is very thin, and the roots of teeth occasionally pass through it. On that account unnecessary force should not be applied in this situation. In such cases I have been in the habit of using trephines of different sizes (fig. 8). After a flap of gum (sufficiently large) has been reflected by a sharp scalpel, I fix the small trocar, which will be observed within the circle of the saw, on the bone to be removed, and with a sharp knife cut firmly down to the bone around the trephine. This divides the periosteum and prevents laceration by the saw. The bone is then easily removed by rotation and firm pressure.

In this operation, sometimes the trocar perforates the tooth, and when an opening sufficiently large has been made, I have known both the tooth and bone to come away together.

Here allow me to suggest, in the interests of

humanity, that great care be taken to use very sharp instruments whenever the soft parts are



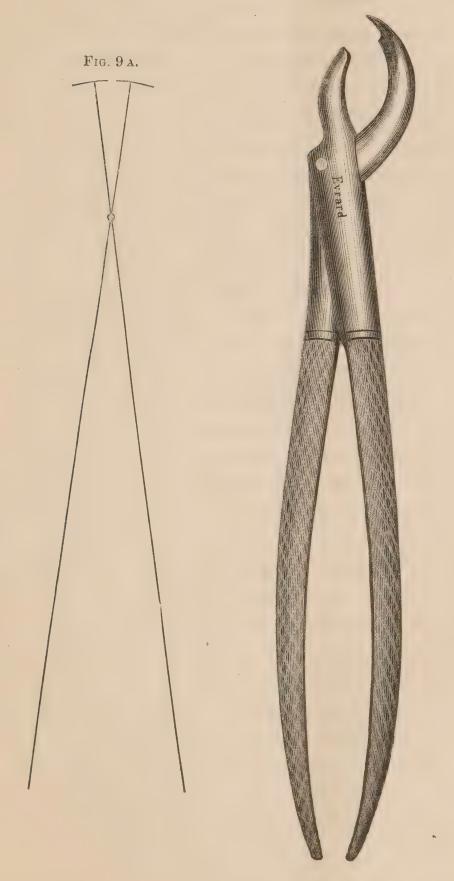
incised. The difference between the degree of pain which is caused by a blunt and that which is

occasioned by a sharp-cutting instrument is very great, and particularly when they are used upon inflamed parts. In many of our operations the edge of a scalpel is turned or notched by pressure against bone at the first cut, and it is unjustifiable practice to continue to use an instrument in that state. Operating while the patient is under the influence of an anæsthetic is likely to produce a careless habit in this respect. It is equally unfeeling to adjust a pair of cold forceps to a sensitive tooth. In extreme cases the instrument should be made warm, and a piece of wash-leather should be placed over the blades.

When the fangs of molar teeth greatly diverge or converge, or are enlarged or united by a deposit of cementum, or are crooked in any of the devious ways which are represented in the plates exhibited, it is very difficult to remove them whole; and, whatever instrument may be used, they will generally be broken.

The great difficulty which is occasionally experienced in extracting the upper molars when they are fractured or deformed has led to the invention of peculiar instruments for this purpose. Mr. Evrard, the celebrated dental instrument maker, of Berners-street, and Mr. Mordaunt Stevens, house-surgeon of the Dental Hospital of London, have requested me to invite attention to some entirely new kinds of forceps invented by them for dealing with these teeth (figs. 9 B and 10).

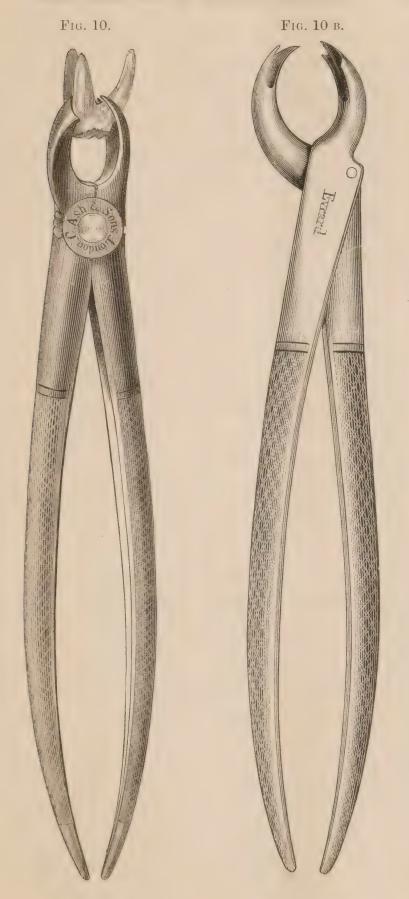
Fig. 9 B.



I have not had an opportunity of testing these instruments, but I am very favourably impressed by their appearance. They shall each be described in the inventor's own words. Mr. Evrard says:-"Tooth forceps are made on the plan of common pincers; that is to say, with two levers connected at a certain point by means of a pin or rivet, as in fig. 9, diagram A; and by moving the handle or longer end we cause the shorter ends or blades to describe an arc of a circle proportioned to the length of those blades. If, however, we want to get hold of an upper molar, we find an irregularity of shape that will require not only a special adjustment, but also a special motion of the instrument, in order that the pointed blades should pass with more facility between the labial roots of the tooth. This will be seen by the diagram B, fig. 9, where the axis of the forceps being placed out of the centre, the long blade moves according to the arc. I am not aware that this plan has ever been applied, and I believe it worth trying."

Inasmuch as I agree with what Mr. Evrard here states, it only remains to be seen whether this instrument will bear the test of experience.

Mr. Mordaunt Stevens says, speaking of his new instrument for the same purpose:—"It is particularly useful in cases where the crown is much broken down. The palatine blade of the forceps is divided into a couple of cow-horn



points, and these slip on each side of the palatine root of the upper molar, grasping it so firmly that when once the instrument is applied it cannot slip off." (Fig. 10.)

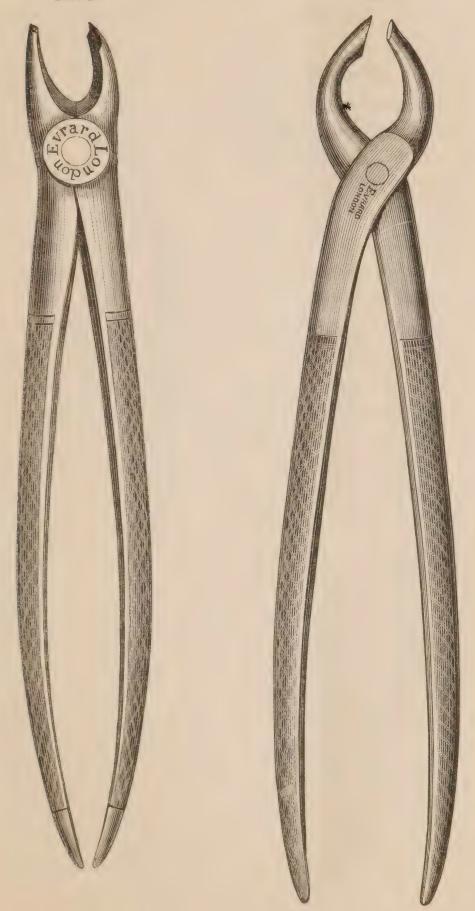
How far there may be danger of fracturing a tooth by adopting either of the two principles here recommended it is not easy to say, but you will see that in one respect each inventor aims at the same object, namely, firmness of fixture. Mr. Evrard gains this effect by a single point passed through the two buccal fangs, with a somewhat longer buccal blade than usual, and a particular construction of the joint; and Mr. Stevens by grasping the single palatine fang in the bifid blade of his forceps, retaining the usual construction of the outer or buccal blade and joint. It is probable that each instrument may require some little modification, but the principles upon which they are constructed seem to me to be a step in the right direction.*

Mr. Coleman's forceps (fig. 11) has the blades bent at a peculiar angle. It has received the approval of experience; and although it differs very little from some which I have used for many years, that variance may be the difference between

^{*} Since this paper was read, Mr. Evrard has brought out a pair of forceps combining Mr. Stevens's cow-horn palatal blade with his own newly-proposed joint and handle (fig. 10 B). Both this instrument and Mr. Stevens's, as originally made, are, I am informed, now very satisfactorily in use at the Dental Hospital of London.

Fig. 11.



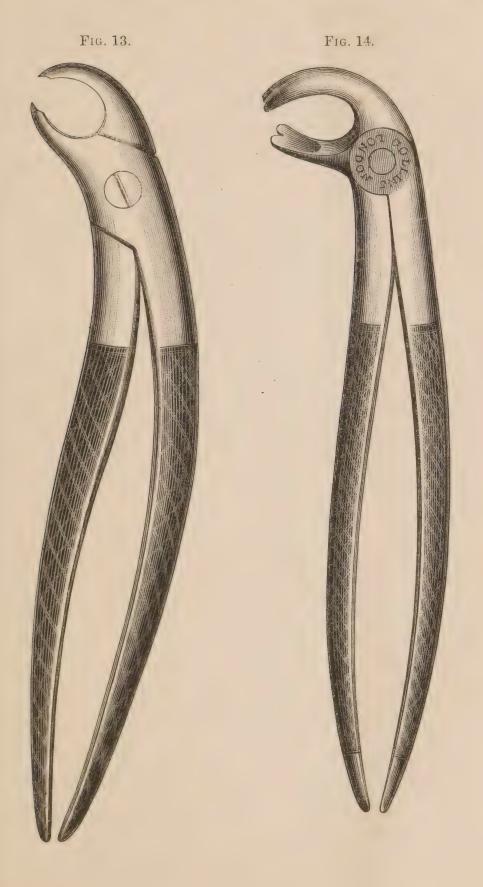


a perfect and an imperfect instrument. Mr. Harding's forceps (fig. 12) is constructed for the purpose of dividing the buccal fangs of broken first or second upper molars. The palatine blade is of the usual shape, but the buccal blade has a cutting edge. It is well spoken of at the Dental Hospital of London, at which institution it has been used with great success.

Not having sufficiently tried any of these instruments, except Mr. Coleman's, I cannot give a practical opinion as to their relative value. They each and all appear to be well adapted to effect the object for which they were designed; but Mr. Coleman's forceps I can strongly recommend, having used instruments made upon the same principle for many years.

For the extraction of first and second lower molars I have been in the habit of using "overhand forceps," the blades of which are fitted to the forms of these teeth, but with handles nearly as straight as those made for the same teeth in the upper jaw. They give greater power, and the upward force is more easily directed, when the patient can open his mouth sufficiently wide. In using them, however, the front teeth have occasionally been chipped, through the mouth being closed upon the handle during an operation.

The value of the "Hawksbill" forceps depends very much upon the angle at which the blades are bent. The best shape I have seen is represented in fig. 13, taken from a pair which have been



placed at my disposal by Mr. Cartwright. Mr. Hutchinson's new "Hawksbill lower molar forceps" (fig. 14) is made with a view to the extraction of lower molars and roots by grasping each side of each root only, without slipping between them; and for this end the blades are made so as to resemble ordinary single-root forceps, with the points made double so as to fit both roots. In describing them, he says:—

"The point going between the roots, as in ordinary forceps, is entirely done away with, on the ground that it serves very little purpose in separating the bone from the necks of the roots, which is the point aimed at in making forceps, and which is the advantage of single-root ones; and so it will be seen the same advantage is gained in this, which is purely and simply a double-root forceps."

I have given Mr. Hutchinson's own description of the supposed advantage of this forceps; but it seems to me better adapted for ordinary cases, where the form of both fangs is retained, than for teeth which have been broken down more or less deeply. In difficult cases the edges of the fangs are often chipped off in an oblique direction, while a union between them is maintained; and then the point between the blades of ordinary forceps (which is wanting in Mr. Hutchinson's instrument) helps to keep the instrument from slipping off the tooth. Any forceps which cannot at once be effectually applied

when one side of a lower molar has been broken off obliquely below the alveolar process does not seem very likely to supersede the elevator, or the forceps which have long been in use for perforating the alveolus. Mr. Hutchinson's instrument may, however, grasp the fangs of weak teeth so evenly as to prevent fracture, in which case it will be a valuable addition to our stock.

Whenever the bicuspids of either jaw convey to the mind of the operator the appearance either of weakness or of firm resistance, I have been accustomed to extract with saw-edged forceps (fig. 15). It is a forceps which was suggested by myself some years ago for the removal of incisor, canine, and bicuspid teeth, under the circumstances which have been alluded to. The outer part of the blade of this forceps acts as a file to enlarge the opening of the alveolus, while the saw at the edge enables the operator to cut deeply into the alveolus, and grasp the tooth when it is much decayed or broken, and especially when it is fractured obliquely. The wedge can be regulated so as to operate on the outsides of the alveoli, if it be desirable so to do; and it can be removed or regulated at will when the time for grasping the tooth has arrived.*

^{*} The various parts of this forceps have been shown in the drawing to enable instrument-makers to construct it correctly. Those I have seen in shops (with the exception of Mr. Evrard's) have had the blades too wide to admit of free motion, and the edges have been more like a file than a saw.

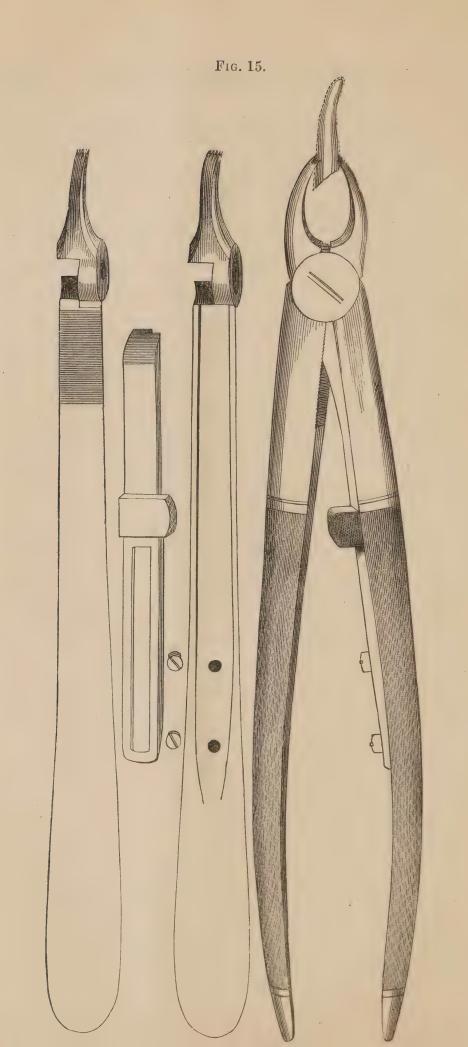


Fig. 16.

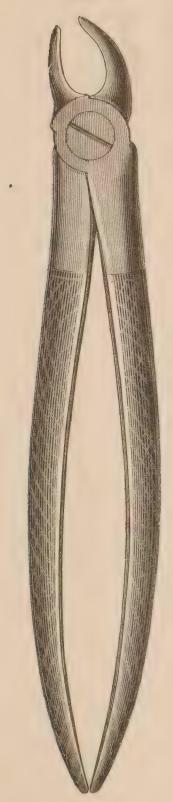


Fig. 16 is a sketch of a pair of forceps which Mr. Cartwright has used for many years past. It fits the bicuspid tooth more evenly than any I have seen, and is consequently less likely to cause fracture.

In concluding this part of my subject, I think it right to direct the attention of the Society to the forceps of various kinds for ordinary use so well described and illustrated in Mr. Tomes's popular work on Dental Surgery; and to add that, while I think it is unwise to attempt to remove teeth of different shapes with instruments which have not been adapted to their particular forms, I consider it equally undesirable to multiply instruments to such an extent and in such a manner as to prevent the hand from becoming accustomed to the feeling of the form of instruments which are in daily use for ordinary purposes. The judgment of the operator is, however, often well tested by the skill with which a suitable instrument is selected for a difficult operation. Just as a carpenter might be deemed foolish if he selected a hammer to perform what a chisel was designed to do, so may a surgeon be condemned for choosing an instrument which is unsuited to his purpose. Again, as conservative surgery may by misapplication amount to malpractice, so may the prejudiced exclusion of useful instruments become a surgical error.

The upper cuspidati are occasionally very long,

and they sometimes require great force for their removal. The longest human canine tooth which has come under my notice may be seen in Plate I., taken from Mr. Tomes's collection. It measures exactly one inch and a half. These teeth being naturally long, and somewhat flat-sided, when their fangs are curved, as in fig. 17, and the

FIG. 17.



alveolus in which they are enclosed is thick and hard, it sometimes requires great care and firm force to displace them from their sockets without fracturing the alveolus, or loosening adjoining teeth. The complications of crowding and irregular position are not unfrequently added to other difficulties. When that is the case, forceps which have one blade narrower than the other are the only kind which can be evenly applied. Teeth, under such circumstances, are very likely to be fractured, and the trephine, or saw-edged forceps, are valuable instruments for the removal of their fangs when they cannot be reached by the elevator.

The roots of the upper lateral and central incisors have occasionally very peculiar curves, which

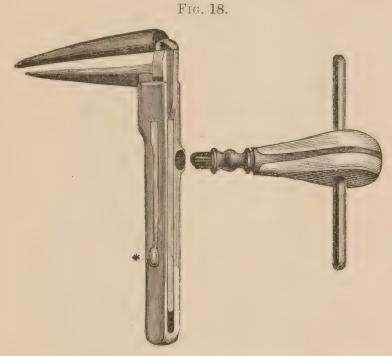
remind one of the manner in which "the devil's coach-horse" of the schoolboy (the Ocypus olens) is accustomed to cock its tail when it is teased. The fangs of these teeth being round, they can generally be slightly rotated in their sockets; and if they be turned in the same direction as the curve in the fang, it is not often very difficult to remove them. Examples of this curve may be seen in Plates IV. and V.

Brittleness sometimes occasions teeth to fracture under the pressure of the forceps. When such a condition is known, or when the neck of a tooth is very sensitive, I am in the habit of placing a piece of wash-leather within the blades of the forceps. In chlorotic and anæmic patients the teeth sometimes crumble into pieces or fracture under very slight pressure; and I have known a whole family to be the subjects of fragile teeth.

Hitherto I have spoken only of difficult operations caused by malplaced, deformed, diseased, crowded, or preternaturally large teeth. Occasionally we meet with teeth of ordinary size and shape which resist all efforts to extract them. The cause of this unusual resistance will generally be found to be hard, thick, unyielding alveolus. I was once unable to extract two such teeth (upper molars), either with the forceps or elevator. It sometimes happens that teeth which have been indescribably painful, after they have been shaken by violent attempts to remove them, cease to give trouble, and are gradually pushed

out; and we often get undeserved credit for extracting such teeth in after-years, when absorption of the alveolus has taken place, and nature has altered their original position by pushing them up from their sockets.

When the lower jaw is fixed by constriction of its muscles, it will be necessary to force it open with a mouth speculum (fig. 18);* but if



the forceps cannot then be used, the teeth must be raised with the elevator, and pushed sideways from the maxillæ. Fig. 19 is a sketch of the instrument in action; and the manner in which it locks together with spring catches may be seen by examination of the various parts.

^{*}This instrument is described and delineated in Mr. Tomes's "System of Dental Surgery," page 581. A steel bar may be placed through the handle, as here represented, when it is necessary to employ great force.

I have seen many cases where patients have suffered in general health for years from diseased roots of teeth being allowed to remain below the alveolus, simply because the practitioner has either been wanting in the courage necessary for the performance of a painful and difficult operation, or has had some foolish prejudice against the use of the elevator. This is a most valuable instrument when wisely selected and skilfully used; and even the much-despised "key" may occasionally be well employed as a lever with the best possible result.

When teeth of the *inferior* maxilla are complicated by any of the worst deformities set forth in the larger plates, the case is far more difficult to treat, partly on account of their fangs being flat-sided, and partly on account of the alveoli in the lower jaw being, generally speaking, more dense than they are in the upper.

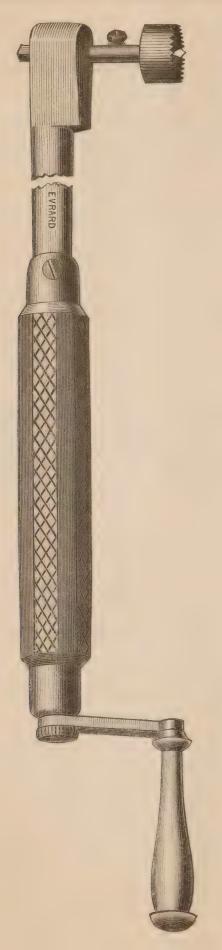
I have before, at one of the meetings of this Society, quoted the case of a poor journeyman butcher who had the whole of the outer plate of the lower jaw split off by the key instrument. The loose bone separated, and was actually allowed to pass down by suppuration through the cellular tissue of the neck, until (after three months' suffering) it came out by abscess below the clavicle. This case warns us always to examine the alveolus after a severe operation; and when it is loose to remove it, and when it is only cracked, to press it back to its original situation,

and to watch carefully for necrosis. Fractures of the alveolar process, to a greater or less extent, frequently occur in the course of dental operations, and the treatment suggested above is suited to all such cases.

Some years after the accident just referred to, I was called upon to extract a wisdom-tooth for this poor man; and I found it so deeply embedded in a mass of hard bony tissue (the result of the former accident), as to make the operation unsafe and impracticable both for the elevator and the forceps. The tooth fortunately was a small well-shaped one, and, after I had cut the hard bone from around it with a rotating circular saw (fig. 20), which was made by Mr. Evrard for the special purpose, I had no difficulty in removing it.

Transverse fracture of the inferior maxilla, although not a common accident, has been caused by a dental operation; but, as full particulars of such a case have not come within my own knowledge, I will not further allude to the subject here, but dismiss it with a recommendation to all who desire practical information as to the mechanical appliances to be used in such cases, to read the instructive pamphlet written by Mr. T. B. Gunning, of New York. A very interesting case of fracture of the upper jaw, which was successfully treated by mechanical means, has been published by Mr. James Salter. (Vide the "British Journal of Dental Science," vol. iii. p. 353.)





Teeth, which by their outward appearance seem to be easy of extraction, sometimes turn out to be very difficult, and vice versâ. I once grasped a lower wisdom-tooth with the forceps, and tried to move it in all available directions, but it remained quite firm. The elevator was used with no better success, and the operation was discontinued, I having failed to loosen the tooth in the slightest degree. This case was probably one of union of the third with the second molar, similar to that illustrated by fig. 21.

Fig. 21.

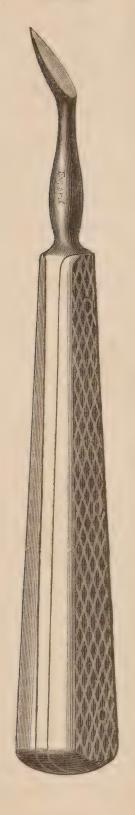


Fig. 22.



In another case, I succeeded in prising up by a bent elevator, without much difficulty, a third molar standing alone in the lower jaw (fig. 22), after a brother practitioner had done one hour's hard labour upon it, and had completely failed. Being forewarned of the difficulty in this case by two surgeons who accompanied the patient, I drilled through the alveolus right into the neck of the tooth, then pressed the tooth away from the alveolus, and placed the elevator (fig. 23) lower on the body of the tooth, at the same time making an upward movement. To my surprise,

Fig. 23.



very little force was required to extract this tooth, which a short time before had given so much trouble. Inflammation of the peridental membrane had probably raised and loosened this tooth between the visits of the patient to her first and second dentist.

Whenever the forceps or elevator is used to extract a lower molar tooth, and particularly the third lower molar, it is necessary to guard against two kinds of accidents, viz., laceration of the gum, by including it within the blades when the forceps is applied, and wounding the soft parts when the elevator is used. I have twice seen a very large piece of mucous membrane torn from the gum up into the throat. In both cases the accident was caused by tough adhesion of the gum to a rough edge at the posterior part of the lower wisdom-tooth. In another case a large flap of gum at the side of the first molar was included within the blades of the forceps, and torn away into the cheek. bleeding from this accident is often very great, and sometimes the patient is unable from inflammation to masticate for several weeks. A sharppointed elevator is very apt to slip and wound the tongue, or surrounding tissues, when it is applied forcibly at the back part of the lower jaw. This accident is generally caused by a patient suddenly moving the head, or grasping the instrument, just at the time when force is first applied,

or the tooth is leaving its socket. It is necessary to guard against such an accident by placing the forefinger opposite the instrument, fixing the jaw firmly, and watching the movements of the patient.

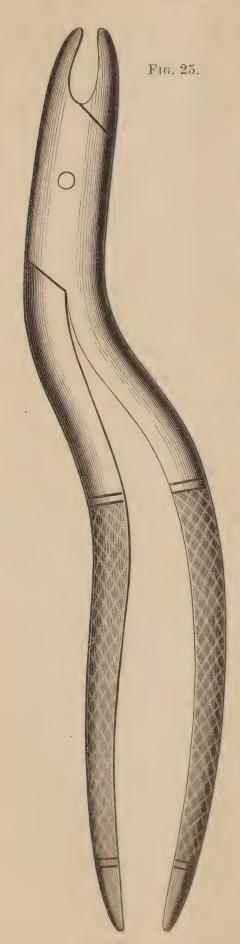
Sometimes the two fangs of a first or second lower molar tooth converge and enclose a thick piece of bone (fig. 24). This is a very strong kind of fastening, called by carpenters the "dovetail." A tooth so formed will, under an operation,

Fig. 24.





occasionally become very loose, and may be moved in all directions, but cannot be extracted either by the forceps or the elevator. When this happens, I would suggest that the tooth should be raised as high as possible, and that one of the fangs should be divided with cutting forceps. If this does not succeed, union of the end of the fangs may be suspected; and they should, if possible, be separated, with a flat and broad elevator passed between them, forcibly twisted, and then moved upwards. Now and then a diffi-



culty arises out of the small space which the operator has to "work in," when a bicuspid, or incisor is broken down below the edge of the alveolus in the lower jaw. If the fang be brittle, and fracture whenever an attempt is made to prise it up, we shall occasionally be obliged to apply the saw-edged forceps, or a small trephine, or to cut away the edge of the alveolus with a sharp scalpel or scolper until the root can be prised up by an elevator, or grasped by suitable forceps.

When the teeth are very irregular and much crowded, it will occasionally be necessary to take a model of the part, and to have such an instrument constructed as will meet the peculiar difficulties of the case. I have one patient whose chin projects so far forward

that the upper incisors could not be extracted with straight forceps. A bent instrument, similar to fig. 25, will, in such a case, admit the chin into the curve in the handle and enable the operator to overcome that difficulty.

The roots of all kinds of teeth occasionally give us trouble when they are curved, dove-tailed, or exostosed. When operating with the elevator on the upper jaw, great care is required to prevent the instrument from fracturing the tuberosity, or pressing a stump into the antrum;* when operating upon the lower jaw, care must be taken to prevent the instrument from slipping and wounding the tongue or other soft parts. When the crown of a tooth has been accidentally broken off very deep in the socket, if the roots be healthy, it is often good practice to leave them in the alveolus and await the result. In the majority of such cases they will gradually be pushed up by deposition of bone, or absorption of the alveolus will enable the dentist to grasp them more easily at some future time. Should the symptoms make their removal a matter of necessity, if they cannot be extracted by the

^{*} I have, from time to time, seen roots of teeth pass into the antrum without causing ill consequences; but an exceptional case happened in my practice some years ago, and is recorded in Mr. Tomes's "System of Dental Surgery," p. 579; and more fully in the "Transactions of the Odontological Society," vol. ii. p. 15.

Fig. 26.

elevator, the alveolar process must be trephined or cut away with a sharp scolper.

I have occasionally brought down a small piece of the fang of a bicuspid, canine, or incisor tooth from the bottom of the socket with a little bent excavator (fig. 26). Necrosed bone when loose may also be extracted from a great depth by a slightly-barbed instrument of the same kind. I have occasionally seen pyæmia produced by absorption of the pus which surrounds dead bone, and that is an additional reason for removing it as soon as it becomes loose.

Dislocation of healthy teeth from carelessness during extraction is not an uncommon accident. I once had an opportunity of showing Mr. Tomes and Mr. Cartwright a lower bicuspid tooth in a lady patient of mine, which had been extracted by mistake, replaced by the dentist, removed and thrown into the road by the patient in consequence of the pain it produced, afterwards picked up, taken home, washed, and replaced in its socket again. It had then been in her jaw twenty years, and was as useful as any of the rest. Sound teeth, which have been taken out by mistake, have frequently been restored to their sockets,

and they generally become firm unless the alveolus has been fractured. When a sound tooth has been dislocated by accident, the socket should be gently freed from coagula, the tooth should be replaced in its right position, and the patient be directed to bite firmly upon a pledget of lint put over the tooth. I have myself restored even the temporary incisor teeth of children when they have been knocked out by accident, and they have remained in the jaw without causing inconvenience until the permanent incisors were erupted. It is sometimes necessary to regulate the upper incisor teeth by turning them, and I have known a tooth slip into the forceps during the operation. Such an accident may be prevented by placing glass-paper around the neck of the tooth, and pressing it towards the socket during the act of turning.

Some severe fractures of the teeth from blows, falls, railway accidents, and kicks of horses, have come under my notice. In the majority of such cases the fangs have not been dislocated, but in some the alveolus has been fractured, and the crowns of the teeth have been literally smashed. Fig. 27 represents a large canine tooth. Fig. 27.

Fig. 27 represents a large canine tooth, which was cut off by the kick of a horse, and the only inconvenience suffered was from a clean cut through the lip, which left a small scar. One of my patients, who received a blow under his chin from



the hoof of a horse while hunting, had large

pieces chipped off from several teeth, molars included. The electric cautery applied to the fractured surfaces was the only treatment that gave permanent relief; chloride of zinc was tried, but failed. Morphia was administered internally to soothe pain until nature threw out secondary dentine. It is wise in some of these very severe accidents to administer stimulants, and to post-





pone an operation when a patient is in a state of shock. Slight additional pain or alarm will sometimes produce fatal results.

Dislocation of the lower jaw often occurs from gaping or opening the mouth very wide; and may, as a rule, be easily reduced by depressing the

lower molar teeth by a bar of wood, or with the thumbs covered by a napkin, and then levering the chin upwards. Fig. 28 shows the position of the condyles when the lower jaw is dislocated. I am indebted to Mr. Luther Holden for this sketch, which is taken from a large diagram in his possession. Such an accident happened to a young lady while I was stopping a tooth (the second molar of the lower jaw), and the dislocation could

not be reduced in the usual way. I therefore levered down first one side, and then the other, with the handle of the stopping instrument, and succeeded in that manner without using much force.

Accidents sometimes occur from the use of mechanical appliances.

Artificial dentures have been known to pass into the larynx, œsophagus, and stomach, but fortunately these accidents are of rare occurrence. They are generally caused by the negligence of the patient in wearing plates which are very loose, after the teeth to which they were originally fastened have decayed away. I once extracted a gold plate from the pharnyx, just above the esophagus, with polypus forceps. While it was loose it occasioned vomiting, but after it became fixed the vomiting ceased, and I was enabled, by pulling the tongue forcibly forwards, to grasp the plate, and it was removed without much difficulty. A remarkable and instructive case of this kind, which could only be released by a very formidable operation, fell under the care of Mr. Cock, at Guy's Hospital. particulars of the operation and the treatment have been recorded in the "British Journal of Dental Science," vol. i. p. 25.

Small gold plates and artificial teeth have occasionally been swallowed, and have passed by the rectum many months afterwards, without producing much inconvenience. In these cases, as a general rule, it is better to refrain from the use of purgatives, and to confine the patient to a moderately solid diet, combined with rice.

I have not in my own practice seen an instance in which a tooth or plate has passed into the larynx or trachea; but such accidents have happened,* and are likely to occur when the sensibility of the pharynx and epiglottis has been destroyed by anæsthesia. In such a case the surgical treatment would be the same as that generally adopted for the removal of foreign bodies from this locality; but if the spasm of the laryngeal muscles were severe, I think it would be wise to perform the operation of tracheotomy without delay.

I have known a gold plate to become buried beneath the mucous membrane under the tongue. The surgeon who attended the patient mistook the case for obstruction of the sublingual duct, and treated it as ranula. After some time a hospital surgeon was consulted, who detected the edge of the plate, and the patient was soon cured by its removal.

Silk ligatures, india-rubber rings, cotton wool, and gold leaf are liable to slip below the gum and to occasion inflammation. Not long ago I saw a

^{*} Vide "British Journal of Dental Science," vol. ii. p. 222; vol. v. pp. 286 and 465.

young lady in whose case an india-rubber ring had been used to draw two teeth together. It had buried itself for seven weeks, and caused granulations to spring up around an upper bicuspid tooth. The cause was at length suspected, and a small vulcanized ring was brought up from a great depth by a slightly-barbed instrument.

The subject of Hæmorrhage is a comprehensive one, and it will be impossible to treat it with due consideration here. Still, as it is a source of much difficulty to the dentist, and great danger to the patient, I venture to introduce it. The hæmorrhagic diathesis is sometimes hereditary, but I am by no means satisfied that the cause of dental hæmorrhage is (as some have asserted) generally to be ascribed to a peculiarly thin condition of the blood, arising from fewness of the red corpuscles. It has been attributed to imperfect coagulability, caused by paucity of fibrine or the presence of free ammonia; but although certain chemical conditions may cause blood to flow more freely, I think the cause of dental hæmorrhage may often be traced to a diseased condition of the blood-vessels themselves.

Dr. Bowerbank has shown that the form of the human blood-discs is double concave, and that their supposed globular form arose from absorption of part of the water in which they were usually examined under the microscope. He

has also shown that they differ in size and number in different individuals. The cause of coagulation of the blood being still an open question, I venture to quote some interesting observations which Dr. Bowerbank has made upon the blood while in the act of cooling.

He says, "If a drop of blood from the finger be put rapidly between thin clean glass, and no pressure be made, and it be placed quickly beneath the microscope with a power of 700 or 800 linear, the molecules will be seen moving irregularly among themselves, but not approximating to each other, but rather obviously avoiding contact, and this action continues until the temperature falls below the point at which their vitality ceases, and then they immediately and very rapidly assume a strikingly different arrangement, passing rapidly over each other, until they resemble a series of rouleaux of coins closely piled on each other, and in this condition they remain. This singular mode of arrangement seems to arise from polaric action, the axis passing through the centre of the blood-disc at right angles to its planes; but until vitality ceases this polaric arrangement never supervenes."

The fact that some of the lower animals separate their young from the placenta by dividing the funis with their teeth, taken in conjunction with the well-established law that incised wounds

bleed more freely than lacerated wounds, explains in some degree why the torn extremity of a healthy dental blood-vessel does not more frequently produce hæmorrhage. The intractable bleeding which occasionally follows the extraction of a tooth, leads me to think that some morbid condition of the coat of the artery, or lack of nervous force, may at times influence its contractile power. Perhaps blood would flow more freely from a diseased vessel which had been rent in an oblique direction than from one which had been divided transversely; or it may be that there is some degree of obliquity between these two extremes which would favour the flow of blood from a vessel the muscular coat of which had lost its contractile power. The pulpy condition of the periosteum at the end of an inflamed root may involve the coat of a vessel and destroy its vitality.

These are speculative ideas, which can only be determined by experiment.

I propose to use the words "dental hæmorrhage" merely to signify such a flow of blood
from the vessels proper to the tooth, gum, or
periosteum, as would be likely to lead the patient
to apply for surgical treatment. I do not, by
this remark, wish it to be understood that there
is any branch of dentistry (except the mechanical
branch), which it would be wise to separate from
surgery proper; on the contrary, I have always

practised under the belief that every branch of surgery should be included in the common word which signifies the art of healing by surgical means, whether it be ophthalmic, aural, obstetric, or dental surgery.

With this explanation, let us consider the subject of dental hæmorrhage.

A free and dangerous flow of blood may follow the extraction of a tooth, which has been most skilfully removed, and it is a vulgar error to suppose that such hæmorrhage has been occasioned by violence. It is, however, true that the extraction of a tooth, accompanied by fracture of the alveolus, is more likely to produce free bleeding than the removal of a tooth without the occurrence of such an accident. I have seen severe hæmorrhage take place a fortnight after the extraction of a deciduous tooth; also after the careful removal of a loose fang; and once in a lady of eighty-four, from loose teeth in the upper jaw striking against the gum below them in the ordinary process of mastication. In this case the hæmorrhage lasted upwards of forty-eight hours, and well-nigh terminated in death. It was ultimately arrested by manual pressure with lint, which was kept up for many hours, and assisted by a teaspoonful of tannin placed over the bleeding gum. Matico in the leaf failed, but Mr. Cartwright tells me it is by

far more effective if applied in the form of powder.

When hæmorrhage takes place from the socket of a tooth which has recently been extracted, small pieces of Turkey sponge, lint, or cotton wool, pressed forcibly down to the end of each canal from which a fang has been removed, and retained in situ, either by the tooth which has been extracted, or by compress and bandage for twenty-four hours, will seldom fail to arrest it. Should that treatment not succeed, I would recommend that powdered matico or tannin be placed in the sockets and forced down by sponge, which should be retained in the usual way. If these remedies also fail, the solid perchloride of iron, nitrate of silver, sulphate of copper, and the actual or electric cautery, may be had recourse to.

There are cases where the vocations of the patient will not allow him to go about with the jaw bandaged. I remember one in point. A medical friend had a canine tooth removed early in the morning, and he returned to me in the fore part of the afternoon with very free hæmorrhage from the socket. Large firm clots were hanging from the part, and certainly, in this case, the hæmorrhage did not arise from any lack of coagulable power in the blood. As my friend had many patients to see that day, he

declined to submit to any treatment which would prevent him from speaking. I therefore wiped out the socket, and while it was comparatively free from blood, applied quickly the solid perchloride of iron. This, as I had expected, at once arrested the hæmorrhage; but I cannot recommend its use except in cases of emergency, on account of the great pain the remedy occasions.

A patient's health is often permanently injured by the unjustifiable length of time during which local hæmorrhage has been allowed to continue. This in my experience has sometimes happened from what I would term feeble practice. right remedies have been used in the wrong way. It is almost useless to plug a socket unless every piece of sponge or lint is pressed firmly down to the bottom of the socket, and tightly bound there, without regard to the inconvenience such treatment must necessarily cause when it is faithfully carried out. It seems scarcely necessary to recommend the erect position, cold diet, and the free circulation through the open mouth of a moderately cold atmosphere; and yet it is important to suggest the practice of common sense, because its rules are so frequently neglected in this particular case.

Reference is here made to two cases of ordinary extraction, with the particular design of calling attention to the manner in which even intelligent patients (from the dread of a severe dental operation) will conceal important facts.

On the 11th of March last, a gentleman came to me to have a difficult operation performed. His teeth had always broken when any attempt to extract them had been made. He wished to take nitrous oxide, but I firmly refused to administer it, on account of some symptoms of congestion of the brain which I observed in the appearance of his eyes and countenance. After I had extracted his teeth, he informed me that only a week before he had received a fall, which had produced severe concussion of the brain. His brother had also died very suddenly from the effects of a small dose of chloroform.

I have, on a former occasion at this Society, mentioned the case of a lady whose pulse became thrice almost imperceptible at the wrist a few seconds after thirty minims of chloroform had been placed in the mouth on cotton wool. The late Mr. Robinson had tried to administer chloroform to this patient, and the symptoms had been so alarming, that he warned her not to risk her life again by taking chloroform. Notwithstanding this, she actually came to me (a stranger), concealed these facts, and urged me very much to administer the drug!

The serious consequences which follow from the use of Anæsthetic Agents, lead me to protest against the reckless manner in which nitrous oxide,

chloroform, and other anæsthetics are now everywhere administered in the most trifling cases, and under the most frivolous excuses, by unqualified practitioners, not for the meritorious object of sparing a fellow-creature the pangs of severe mental or bodily pain, but for the purpose of calming cowardly fear and gaining unmerited reward.

A paper professedly written "On the Difficulties and Accidents which happen in the Practice of Dental Surgery," would be culpably incomplete if the accidents and ill consequences which follow upon the use of anæsthetic agents were either garbled or concealed. By their poisonous effects the dentist is sometimes brought suddenly into conflict with "the King of Terrors;" and it behoves him to consider, should a serious emergency arise, how far the life of the patient is safe in his hands.

Among the occasional evils produced by anæsthesia, I would particularly mention that which flows from involuntary garrulity. Patients in this state may reveal secrets which they would study to conceal from the very persons who accompany them to the surgery. Amatory symptoms, although rare, do, from time to time, occur in both sexes; and serious charges have been made, and brought to trial in our law courts, that have been based upon a firm belief in a fictitious dream which had remained permanently fixed upon

the mind of the patient.* This delusion is sometimes produced when true revelations have been made and not remembered. According to my experience, amatory symptoms are more likely to occur in the female sex during the catamenial period. They have been caused most frequently by æther and chloroform; less frequently by nitrous oxide. Mr. James Salter, who has favoured me with full particulars of three cases of amatory excitement which were caused by æther and chloroform, assures me that he has not met with one instance in which the bichloride of methylene has produced that effect.

It is evidently the duty of the professional man to guard the honour and interests of his patients as carefully as his own; and perhaps this principle could be best carried out if the following rules were universally adopted:—

- 1st. That no kind of anæsthetic be given to a patient unless a third party be present; and
- 2ndly. That no person be allowed to be present during its administration, but the operator and such assistants as he may deem desirable, and the medical attendant of the patient.

^{*} A case of this kind was tried at the Central Criminal Court, July 12th, 1847, particulars of which are reported in the "British Journal of Dental Science," vol. x. page 330.

Hysterical and epileptic spasms are the most common difficulties produced by the action of anæsthetic agents. In such cases the tongue and person of the patient should be protected immediately, and neither blood nor teeth be allowed to pass into the larynx. Cold water may, in either case, be dashed in the face; and I have sometimes seen an hysterical fit cut short by forcibly pressing upon the larynx, and an epileptic fit terminated by placing salt in the mouth—care being taken to prevent it irritating the glottis.

Inordinate muscular and mental excitement are two of the most unmanageable difficulties which are caused by anæsthetic agents. I believe those results have now happened sufficiently often to warrant the adaptation of a portable cross-bar to every operating-chair. The only objection which can fairly be raised against its use is the injury it might possibly do in the event of advanced pregnancy, in which case an elastic belt, placed loosely around the chest and arms, might be substituted.

A semi-comatose condition is another disagreeable effect of anæsthesia. Mr. Charles Tomes and myself have recorded cases of hysterical coma so produced;* and it is a remarkable fact that in each case nitrous oxide had been given to the patients *twice* on the same day. I do not think much

^{* &}quot;Transactions of the Odontological Society," vol. i. p. 59, and vol. iii. p. 43. New series.

danger is to be apprehended from this symptom, but the friends of the patient naturally become alarmed; and, under such circumstances, it is desirable, as quickly as possible, to restore consciousness. Strong tea or coffee and constant perambulation of the patient, with the cold douche and inhalation of strong ammoniacal gas through the nares, are perhaps the best remedies.

General debility, sore throat, and loss of memory, are sometimes occasioned by the inhalation of chloroform. Change of air and scene, or tonic medicines, when the symptoms do not yield to stimulants and generous diet, may be suggested as the means most likely to restore health. I am unable to suggest any certain remedy for the kind of headache and vomiting which is sometimes produced by anæsthetics. They arise from bloodpoisoning; and therefore fresh air, "rest and lying still," constitute the most reasonable treatment.

The sudden failure of the pulse and complete collapse threatening death, which occasionally happens during anæsthesia, is perhaps the most appalling difficulty which the dentist has to deal with. I have many times seen a very near approach to that condition, from the effects of chloroform. The admission of fresh air (if possible, mixed with oxygen gas), loosening of the dress, sponging out the mouth, drawing the tongue forcibly forward, sharp blows upon the surface with a wet towel or the flat hand, and the

performance of artificial respiration, are perhaps the first things to be quickly done; but tracheotomy, inflation of the lungs, galvanism, and the injection of brandy into the stomach and rectum, should each and all be resorted to and practised in very serious cases. If the patient be deathly pale he should be placed in the full recumbent position upon his left side (the head being lower than the body); and when the blood-vessels of the face are engorged, the erect posture is indicated.

The manner in which nitrous oxide produces anæsthesia has not, to my mind, been satisfactorily proved, and it will be impossible to propose any other than empirical antidotes against its poisonous consequences until this question has been determined.* That the heart continues to beat for some time after respiration has ceased under the action of nitrous oxide, is a well-established fact; but when once

^{*} In some of my earlier experiments on the lower animals, recorded at page 57, vol. i., new series of the Society's "Transactions," I failed to produce anæsthesia by simple suffocation, induced, as there described, by the continued re-inspiration of the same air; but I have since performed a similar experiment in the presence of Mr. Harrison, of Keppelstreet, London, Mr. Burford Norman, of Southsea, and Mr. Robinson, of Ditchling, in which perfect anæsthesia was produced by carrying the asphyxia, so caused, a degree further; and the animal which was operated on is still alive and well. This I consider a most important physiological fact in connection with this question.

the breathing has entirely ceased for one minute, in no case have I found it possible to restore the animal to life by artificial respiration, or any other known remedy. In one of my experiments a strong female cat was made to inhale nitrous oxide through Snow's inhaler for two minutes. At the end of the third minute the heart was still beating, but no respiratory effort was noticed, nor could the breathing be restored. The tongue and mucous membrane of the mouth had a blue appearance.

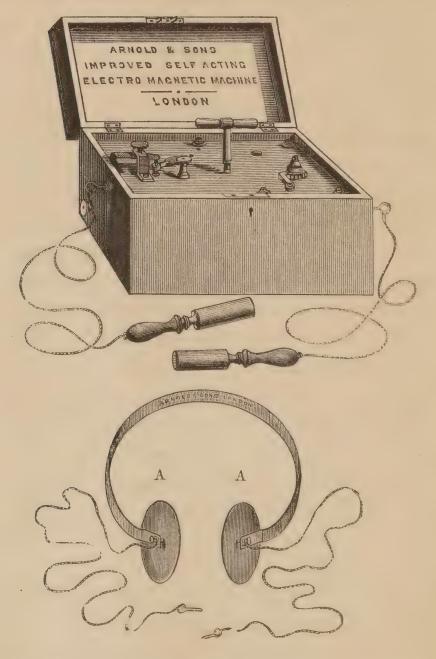
Should dangerous symptoms arise during the administration of nitrous oxide to the human subject, these facts seem to indicate the necessity of using remedial measures before the breathing has entirely ceased; and the blueness of the tongue also suggests the artificial inflation of the lungs by oxygen gas in very extreme cases.

The question whether the respiratory muscles can be brought into action by galvanism after natural breathing has ceased, or whether this agent will assist artificial respiration to restore animation under such circumstances, is a very important one.

Fig. 29 represents a new portable battery, invented by Messrs. Arnold & Son, of West Smithfield. At my suggestion they have adapted a spring with two plates (AA) for the purpose of instantly conveying a galvanic current to any part of the human body in case of suspended animation

under the use of anæsthetics. The instrument is thus described by the inventors:—

"The advantages of this battery over those in Fig. 29.



present use consist in its simplicity and the easy manner in which it is set in action. It can be kept wound up ready for immediate use. The instrument is self-acting; and, by the addition of a fusee, can be kept in action for ten or fifteen minutes, according to the speed, by simply turning the regulating nut to the right to decrease, and to the left to increase, the velocity. The force of the current is regulated by the speed, and the instrument is provided with a small screw or break-power, which, when turned down, stops the current instantaneously."*

Passing from the strict region of surgery, there are also connected with my subject difficulties of medical diagnosis and treatment, which time will only allow me to allude to in a cursory manner; such, for example, as arise from the fact that the diseased part of a tooth may be concealed from view, and yet by reflex action produce paroxysms of pain in remote parts of the body. The teeth, in their turn, likewise become painful from the effects of various blood-poisons, and low conditions of the general health. Even learned physicians of the present day are, from time to time, "perplexed in the extreme" to account for the anomalous symptoms which are produced by irritation of the dental nerves.

The brilliant discoveries of Marshall Hall enable us to understand the manner in which irritation of the sensitive pulp of a tooth may occasion violent

^{*} I have tried the effect of this instrument upon the lower animals, and have found its action to be very perfect.

spasm, even of the uterus, as was seen in the very interesting case brought under the notice of the Society some years ago by Mr. Sercombe*; and the more recent experiments of M. Brown Sequard teach us how deafness may be, and has been, produced by diseased teeth—as in the cases which have been recorded by Mr. Tomes and myself.† Still, we see in daily practice such grave symptoms produced apparently by so small a cause in one patient, whilst no such sequences are observed in another, or even the same patient, under different circumstances, that we need great watchfulness to detect, and the utmost skill to treat them.

Without, however, entering upon a wider field of inquiry, the "difficulties and accidents" which have already been enumerated as incidental to our department of the profession surely prove beyond contradiction that a Dental Surgeon should be possessed of a strong will guided by good judgment, a firm hand capable of gentle manipulation, and a mind well stored with medical science. If it be true that many in our ranks do not possess these qualities, and that such men only practise for the purposes of gain—while we throw a veil over human errors, let the members of this Society guard well their own professional conduct,

^{*} Vide "British Journal of Dental Science," vol. iii. p. 221.

^{† &}quot;Transactions of the Odontological Society," vol. ii. p. 308. New series.

and strive, collectively and individually, to advance the character of dental science; and then the tree of knowledge which the Society has planted will bear golden fruits to the honour of those who help to rear it!

In conclusion, I beg to offer my cordial thanks to Dr. Bowerbank, Dr. Webb, Mr. Cartwright, Mr. Tomes, and Mr. Willoughby Furner, for the generous assistance they have given me in various ways during the composition of this paper.

Discussion.

The President said he was sure they must all have felt deeply interested in Mr. Cattlin's paper, from the comprehensive manner and the various aspects in which he had brought his subject before them. Mr. Cattlin had, however, covered so much space in touching upon anæsthetics, and other points, besides those of the difficulties and accidents arising from the extraction of teeth, that he was afraid they would be unable to go at length into the discussion of all those points this evening. Though the ordinary time for adjourning had arrived, yet, if it was the will of the meeting, they might prolong their sitting for half an hour, and hear some gentlemen upon the papers before them now, and defer the completion of the discussion on both to the next meeting.

Mr. Cartwright wished to make one or two remarks on Mr. Fox's paper. In the first place, Mr. Fox advocated operating, when extracting teeth, invariably from one side of the chair. He did not think, and he believed there were others present who would agree with him, that it was desirable practice to confine the operator to one side. He, himself, was not particular what position he took. No doubt Mr. Fox's instruments suited the practice he advocated; but there were instruments the use of which would be in no little degree awkward if always applied from the right side. Mr. Fox had referred to hawk's-bill forceps as being constructed so as to cause injury to the outer plate of the alveolus, comparing its action on that account to the key. He had been in the habit of using the instrument constantly, and had not been in the habit of injuring the alveolus. It was inconvenient, he considered, to operate with hawk's-bill forceps from the right side, when teeth on the left side had to be removed, since the arm had to be passed over the patient, and the head turned, to further the convenience of the

operator. He found it more easy to operate from the left side when a left-side tooth was to be extracted. He (Mr. C.) made these observations in the interests of young practitioners, who might be swayed by Mr. Fox's remarks to adopt his principle as to position, and so to lessen the power of, or to lay aside, a valuable instrument. Referring to the elevator, Mr. Fox inferred that it was a dangerous instrument to use, because it might damage the alveolus and periosteum, or injure the gum. When the principle of the ordinary straight elevator was considered, it would be found that the fulcrum pressure was very small; and if carefully applied and used, there was little chance of mischievous results. There could be no doubt that for upper wisdom-teeth it was the worst possible instrument to use, inasmuch as the possible, if not probable, result would be fracture of the tuberosity; but for the removal of lower wisdomteeth it was invaluable, and did not fracture the teeth, nor, in the majority of cases, increase pain; and it was, as Mr. Fox remarked, very useful as an adjunct to the forceps.

Mr. Cobb did not know whether he was in order in asking Mr. Cattlin by what means he succeeded in placing the double-pronged upper molar forceps in situ. He did not understand how, having placed it on one side of the tooth, the other blade could be closed upon it without lacerating the outer gum.

Mr. Cattlin said the forceps were those of Mr. Stevens, who, being present, would doubtless answer the question.

Mr. Charles Tomes, without wishing to prolong the discussion, must express a hope that, before the next meeting, Mr. Cattlin would augment his paper by giving his grounds for the view he had taken with reference to a subject very much discussed, viz., the anchylosis of teeth. He must also ask Mr. Cattlin to furnish his authority for the fact that dental hæmorrhage was caused by the deficiency of the red corpuscles of the blood. Modern physiology led him to take different views upon these points, especially the latter; and if Mr. Cattlin would furnish his authority, some light would be thrown on the subject.

Mr. Cattlin considered Mr. Tomes had misunderstood him.

He had mentioned that it had been asserted that dental hæmorrhage was caused by the absence of red blood-corpuscles, and he had added, that he doubted the accuracy of the statement.

Mr. Tomes had not so understood the passage.

The President having a duplicate of the paper before him read the passage to the meeting, which went to confirm Mr. Cattlin's statement.

Mr. Coleman having taken the same reading of the passage as Mr. Tomes, was glad it had been called in question, and cleared from obscurity.

Mr. Tomes was glad to find he was wrong. He could not however admit that it was a generally accepted doctrine, that a deficiency of red blood-corpuscles would prevent firm coagulation, their function being probably purely respiratory.

It having been here suggested that the discussion should be adjourned until the next meeting,—

Mr. HARRISON said that, with the postponed discussion on Mr. Fox's paper still unfinished, and the mass of matter that had been brought under their consideration by Mr. Cattlin in the very excellent paper just read, he was of opinion that it would be impossible for them to discuss all the various subjects they had before them, in a manner to do justice to the subjects themselves, or credit to the scientific character of the Society, in any time they were likely to have at their disposal during the remainder of the present session; for it must be remembered that they had other papers promised them for the two remaining meetings. So far, therefore, from agreeing with the suggestions thrown out, that the further discussion on these papers should be postponed until their next meeting, and that Mr. Cattlin should, in the interim, augment his paper by going more fully into the subject of "hæmorrhage after extraction," he would suggest that they should use all the time they had at command that evening, and, moreover, that they should agree, under the President's direction, to confine the discussion on both these papers to such points as he (the President) might

think most desirable; as he considered it better, on so practical a subject, to discuss a few of the points that had been touched upon, thoroughly, than to run over the whole in a discursive and cursory manner. He begged it to be understood that it was in no factious spirit that he threw out these suggestions, put as an old member of the Society, anxious to maintain its practical, as well as scientific, reputation. If these suggestions met the approbation of the President and the Society, he should be happy to make a few observations at once on those points the President might name.

Mr. Coleman thought there was a great deal of good sense in Mr. Harrison's remarks. He wished to ask the President, seeing that Mr. Cattlin had taken so wide a grasp of his subject, whether he could not, in the exercise of his prerogative, restrict the discussion at the next meeting to one or two points only?

The President having intimated that he thought the discussion had better be confined strictly to "extraction," and to the "difficulties and accidents" arising in the practice of Dental Surgery, in accordance with the titles of Mr. Fox's and Mr. Cattlin's papers, and said that he should be happy to hear any remarks Mr. Harrison had to make during the remainder of the time still at their disposal,—

Mr. Harrison commenced his observations, but, not having completed them by the hour of ten, was stopped by the President at that time, with a request that he would open the discussion at the following meeting.

The President then returned the thanks of the Society to those members who had contributed easual communications, and to Mr. Cattlin for his paper; and the meeting was adjourned.

[Note.—We have thought it best to reserve the publication of the observations made by Mr. Harrison until the whole of his remarks can be published together.—ED. "Trans."]

GENERAL MONTHLY MEETING,

Monday, May 1, 1871.

J. R. MUMMERY, Esq., President, in the Chair.

THE Minutes of the last Meeting were read and confirmed.

The following gentlemen were proposed as members of the Society:—

Mr. WILLIAM ALFRED HUNT, M.R.C.S., Yeovil.

Mr. Harry Blandy, Nottingham.

Mr. Duncan W. Amore, Hastings.

The President having invited casual communications—

Mr. Gibbons exhibited a superior lateral which he had extracted from the jaw of a young lady seventeen years of age, the fang of which was absorbed into the pulp-cavity, no doubt by the pressure of a retarded canine. When he first saw the case, the point of the canine was visible above the lateral, and, considering that the alveolar process was injured by absorption, he advised the removal of the tooth. Mr. Thos. Rogers was also consulted respecting it, and gave the same advice.

The Secretary then read the following communications from Mr. Thomas Fletcher, of Warrington, and Mr. C. S. Tomes:—

AN IMPROVED FORM OF BLOWPIPE.

"To the Secretary, Odontological Society.

"15, Bold-street, Warrington, April 10th, 1871.

"Dear Sir,—The following modification of the ordinary mouth blowpipe will be found to produce to heating power sufficient to fuse a platinum wire of moderate thickness, and make it possible to fuse three ounces of gold on a piece of charcoal with ease. I enclose some pieces of platinum and iron wire which have been melted into beads with it, an operation totally impossible with an ordinary blowpipe.

"A piece of $\frac{1}{8}$ -inch brass tubing, about eighteen inches long, must be pointed at one end to make a blowpipe nozzle, and the remainder, with the exception of three or four inches at the other end, must be made into a close coil round the gas-tube (it must be previously filled with resin or lead to prevent it collapsing). The nozzle should then be bent into proper position, and a small elastic tube with a mouthpiece fitted on the other end.

"A branch gas-pipe must be brought under the coil, and a small Bunsen's burner attached to the end, the flame of which will surround the coil. By this means both gas and air are heated sufficiently to char paper before being burnt, and the heat of the flame will be found far more intense than when coal-gas and air are used.

"When a small point of flame is directed against a piece of lime, the light emitted is unbearable to the eye.

"Faithfully yours,
"Thos. Fletcher."

Note by Mr. C. S. Tomes, Curator of the Museum, on Specimen No. 256 (Wall Case C), presented at the last Meeting of the Society by Mr. Bellaby, of Nottingham.

"THE crown of this tooth does not greatly deviate from the form of normal teeth, the four cusps and the oblique ridge characteristic of the upper molars of man and certain apes being more than ordinarily distinct.

"The implanted portion is of quadrate form, somewhat flattened from before backwards, and distinctly divided by a medium longitudinal groove on its outer and inner sides; for about two-thirds of its length it tapers, but, instead of diminishing to a blunt point, it suddenly expands, the end being in the form of a deep cup, the concavity of which looks upwards.



"This cupped extremity is nearly as large as the crown of the tooth, and its edges are produced at several points into processes, which, however, do not appear to be homologous with the normal three fangs of an upper molar. It is coated with thick cementum, which to the naked eye has much the appearance of enamel; this cementum is thinnest at the bottom of the cup.

"The nerves and vessels do not enter by a single foramen, but by several small foramina situated on the edge of the cup.

"On section, the pulp-cavity, which was almost filled up by secondary dentine, is seen to be spread out into a similar trumpet-shaped form at its upper extremity, approaching close to the surface all round the circumference of the cup which terminates the tooth.

"It is remarkable that this unusual deviation from the form of a normal tooth should be represented also by the specimen which stands next to it in the Museum (No. 257); the very close similarity between the two suggesting that something else than mere accident has determined its shape, though why this particular shape has been attained is not easy to see.

"Charles S. Tomes,
"Curator of the Museum."

The President said that it would be in the recollection of the Society that at the termination of the last meeting it was arranged that the further discussion on Mr. Fox's and Mr. Cattlin's papers should take place at the present meeting, previous to the reading of Professor Flowers' paper. It had been found impossible, however, to bring out the April number of the Transactions in the interim; and as he thought it desirable that the members of the Society should have an opportunity of refreshing their memories on the various topics touched upon in Mr. Cattlin's paper before proceeding to discuss it, he would suggest that the discussion this evening should be confined to Mr. Fox's paper only, leaving that on Mr. Cattlin's for some future time. He then called on the Secretary to read the following letter, received from Mr. Fothergill, of Darlington, by way of opening the discussion:—

"TO THE SECRETARY, ODONTOLOGICAL SOCIETY.

" Darlington, April 15th, 1871.

"SIR,—I have read with pleasure Mr. Fox's paper on extracting teeth, in the 'Transactions of the Odontological Society,' and, as many of his views coincide with those I have been led to form, I feel inclined to send you a few remarks as the contribution of an absent member to the discussion which is to take place at the next meeting. It is rather singular that a subject of so much importance to dentists has never before claimed the notice of the Society. By constant practice, doubtless, most dentists attain a facility in taking out teeth and fangs, and it is natural that they should do it best in the way they have got accustomed to. At the same time it is very desirable that young men who are beginning to acquire the art should be taught the best methods of using their instruments, and the best positions in which to place their patients. I have been surprised, whilst looking on at the Dental Hospital, to see a patient's head placed so far back for operating on the upper teeth as to make the traction horizontal, occasioning loss of power and unnecessary shaking to dislodge the tooth: the head should be just high enough and far enough back to obtain

a good view of the tooth, and for the traction to be downwards. For lower teeth it is desirable to have the patient below you, and the head well forward. If the tooth is at the left side, the operator's left arm should be over the patient's head, and the jaw be steadied with his hand. In almost every extraction one or more of the fingers of the left hand should be placed on the adjoining teeth. It is most distressing to see the head wriggle about for want of support. Personally, I have the same objection to hawksbill forceps as Mr. Fox appears to have; but it may be prejudice. I agree also with Mr. Fox's remarks about using the elevator for lower wisdoms.

"The majority of these teeth can be taken out with forceps, and probably with less suffering to the patient than is possible with the elevator. As a rule, I should never use the elevator for anything I could do with forceps.

"In what, at best, is so painful as tooth-extracting, it is our duty to study to cause the minimum of pain, and it is also very desirable to avoid as much as possible awkward and ungraceful postures, and especially to avoid any appearance of roughness or coarseness that might produce an unfavourable impression on any one who may witness our operations.

"If these remarks are worth reading, they are at your service.

"I am, &c.,

"WILLIAM FOTHERGILL, L.D.S., M.O.S."

Mr. Dennant agreed in the main with the letter just read, and with very much that Mr. Fox had suggested in his practical paper; but there was one little point upon which he differed in practice, and he was anxious for the opinion of others upon it. Mr. Fox, he believed, stated that it was his invariable rule to press the forceps inwards against the stronger wall of the alveolus. He (Mr. Dennant) frequently adopted a different course in extracting the upper molars. He attempted a steady outward pressure, and if no great resistance offered, he dislodged the palatine fang slightly, and then applied the inward pressure, and so removed the tooth. He thought that the denser structure of the palate bone, and often widely divergent

fangs, rendered the fracture of the palatine fang probable, if much inward pressure was exerted. On the other hand, he was careful not to carry the outward pressure too far, when first of all starting a tooth, and if he felt much resistance, he would at once alter the direction of force. He quite supported Mr. Fox's opinion respecting the elevator, and greatly preferred the forceps. To his mind, forceps did the work much more expeditiously, afforded more satisfaction to the operator, gave less pain to the patient, and lessened the risk of injury to the surrounding structures, and he never used an elevator when he could apply the forceps. He agreed with Mr. Fox as to large, clumsy instruments being too much in vogue, and thought they should never be larger than was necessary for strength. While upon this subject he would refer to the stump forceps very generally in use, and which, in his hands felt clumsy; for instance,—when the fang of a broad bicuspid was embraced, the handles would be opened to the extent of one inch and seven eighths; this, in a moderate-sized hand, produced such a tension of the muscles, as to destroy that delicate sensibility of touch which was so essential to the safe manipulation of a very carious root. Some two or three years since, Mr. Collins made him a pair of forceps [which he then exhibited] which they would see, while grasping a wide fang, had the handles open only to the extent of one inch, so that the instrument could be gently rotated in searching for a root, and the operation would be effected by the simple movement of the wrist, instead of the more awkward and clumsy one of the elbows, as in the case of the open-handle forceps. There was nothing novel in the long blades, as they had been suggested by Mr. Tomes for the removal of fragments; but those he was speaking of had different points, and had the advantage of considerable strength, so that there was not that tendency to spring that there was with the more slender blades.

Mr. Cartwright, if allowed to speak a second time on this subject, must say that he did not agree either with Mr. Fothergill or Mr. Dennant with reference to the elevator. It was, in its place, one of the most valuable instruments they had, and he objected to gentlemen getting up and stating that it was not

a proper instrument to be used. Indeed, he did not see how operators could get on without it.

Mr. Coleman thought that the difficulties with which they had to cope in the extraction of teeth were most strongly presented in the lower wisdom-teeth. After his experience, he should be very sorry if they condemned one of the most valuable instruments at their service in such cases. If one happened by mischance to fracture a lower wisdom-tooth below the alveolar process, with a cautious and proper use of the elevator, one could in almost all cases move the tooth sufficiently from the alveolus, so as to remove it with this instrument or the forceps. In no one particular case was the elevator better adapted than for such as he had indicated, and he had seen it in the hands of the most able operators at the Dental Hospital overcome difficulties which otherwise would have been almost insurmountable.

Mr. Sercombe said, if he understood Mr. Dennant correctly, that gentleman raised no objection to the employment of the elevator in cases where the forceps could not be used, but only to the free use which some practitioners appeared to make of it. If that was the case, he entirely agreed with him that the elevator was often needlessly employed, and where, if the forceps had been used, the patient would have been saved much needless pain. He never used the elevator when he could use the forceps; but there were cases when he was very glad to have the elevator at his command.

Mr. Gregson entirely endorsed what Mr. Cartwright had said about the elevator. He could never do without it. In cases where a stump could be got at with the forceps, and be reached with less pain to the patient, he used that instrument; but in other cases, such as the wisdom-tooth root, especially when broken down, he had no hesitation in first removing the gum and then using the elevator.

Mr. W. A. Hunt (Yeovil) thought from Mr. Dennant's description that the forceps he had exhibited somewhat resembled the American bayonet forceps. He had discarded the use of the

elevator to a very great extent, since he had possessed these forceps. In the case of upper biscuspid teeth, which were very difficult teeth to remove, when, as often happened, they were of a friable nature, the elevator was very difficult of application, and the forceps he had mentioned were more serviceable.

Mr. Dennant wished to explain that he did not mean that these forceps should supersede the elevator so much as the ordinary stump forceps with short blades. He did not wish to be understood as ignoring the elevator entirely; but he would only use it in very exceptional cases, when forceps could not be applied, which cases were rare with him.

Mr. Gregson thought that, in extracting upper wisdom-teeth, the use of the elevator was inadmissible, and that its application would risk dangerous consequences.

Mr. Charters White, whose lot it was to extract some thousands of teeth every year, and who twice a year had to attend the Royal Victoria Patriotic Asylum, and extract, upon an average, 500 teeth in a day, never used any other instrument but the forceps, with which he could take out teeth at the rate of a hundred an hour. He would not say that the elevator was inadmissible in every case. Sometimes to get at an upper molar which was neither a tooth nor a root, he took the elevator, and, by forcing it into the pulp-cavity, he separated the fangs, finishing the operation, however, with the forceps. In his younger days, when a student at King's College, he had seen Mr. Cartwright use the elevator with a dexterity and a grace which would fascinate the most critical. But it was not always in such skilful hands, and when such was the case, much mischief might arise if it was allowed to slip, a possibility that he contemplated with some dread. He knew the elevator was used, and very successfully, but he preferred and always used the forceps. He thought they could not but admire Mr. Salter's manly desire that they should at these meetings relate their accidents as well as their successes, and, following out that desire, he begged to call the attention of the meeting to an accident which occurred in his practice about eight years ago.

Being called upon to extract a carious left lower molar, he found that the crown of the second bicuspid leaned over and partly occupied the cavity in the molar tooth, which, when extracted, he found had brought away the second bicuspid with it, attached at their fangs by a soft pulpy mass. Recollecting that teeth had been extracted and reinserted and had become firm again, he separated the sound tooth from its carious neighbour, and, without waiting to clear the socket, he forced it down into its place, and tied it in with a ligature of silk twist. He had lately an opportunity of seeing the tooth again, when his patient reported that she had never suffered any pain in it after the few first days, and its colour was as perfect as the other teeth. He could only suppose that in this case perfect union had taken place between the nerve and the vessel. The young lady, the subject of this accident, was about sixteen years of age at the time of this extraction; and when they remembered the open state of the apex of the fang of the bicuspid teeth at that age, they might perhaps be justified in this supposition.

Mr. Gibbons had had a very similar case six or seven years since, his being a second molar tooth taken out to allow a wisdom-tooth to be removed, and which it was impossible otherwise to extract. He had seen the replaced tooth lately. It had never given any trouble to its owner, and its colour was good, yet he had no doubt that the nerve was dead, and that the vitality of the tooth was sustained alone by the membrane.

Mr. Gregson would mention a case of facial abscess having existed for some time, and caused, he thought, by the pressure of a wisdom-tooth placed abnormally in the lower jaw. A sound second molar stood in the way of its removal. Instead of taking out the second molar, he simply excised the crown of the wisdom, from which operation no pain or trouble had been caused to the patient. The man was seen a week afterwards, and the abscess was cured.

The President would have thought that it would. He had had a very difficult case sent to him, in which the position of the teeth was certainly most awkward. The patient was a

lady of highly sensitive organization, who refused to take any form of anæsthetic. The fangs of the third right lower molar were directed towards the ramus, the crown being deeply imbedded into the neck of the second molar, so that these teeth were firmly impacted together, each tooth preventing the other from being removed. He discovered that caries had commenced in the second molar at the point of contact, and the difficulty was solved by first cutting away the distal portion of the crown of that tooth, which, being thus set free, was then removed without much difficulty, and the third molar readily followed. He had not as yet heard any expression of opinion as to the use of the hawksbill forceps.

Mr. Gibbons had used them exclusively for the last three or four years. In some hands he thought they might prove dangerous, almost as dangerous as the key. When used for the left side, outward pressure must be carefully avoided, to prevent the displacement of the outer alveolar wall. He, however, preferred them to a straight instrument.

The President said they doubtless required more special mastery, to be alone acquired by long practice, than the ordinary instruments.

Mr. Fox said that in view of the paper which Professor Flower was even now waiting to read, the interest and value of which was evidenced by the beautiful diagrams displayed before them, he would ask permission of the President and members to defer his reply to the remarks which had been made on his paper, to the next meeting, when he would make it as brief as possible. But while making this request there was one point which he could not in justice to himself allow to pass wholly unnoticed or unanswered, however briefly, on this occasion, and that was with regard to the use of the elevator. This unfortunate elevator seemed to have completely "stopped the way." He very much regretted if any sentence in his paper had been so framed as to lead to the supposition that he unreservedly condemned the use of that instrument. All that he condemned was an indiscriminate

use of the elevator on many occasions when the forceps could be more advantageously employed, and he could not but feel that if those gentlemen who had been so earnest in their denunciation of his supposed condemnation of the instrument in question had taken the trouble to read his paper carefully before discussing it, they would have discovered that in many cases he advocated the use of the elevator. Having entered this little protest against the supposition that he was an opponent to the use of so useful an instrument, he begged to repeat his request to be allowed to defer his reply to the next meeting.

The President thought they would see the propriety of Mr. Fox's request, as the time had arrived for Professor Flower to read his paper.

Mr. Fox's reply was therefore deferred.



Notes on the First or Milk Dentition of the Mammalia. By William Henry Flower, F.R.S., Hon. Member of the Odontological Society of Great Britain.

GENTLEMEN,-

Having been requested by our respected President to address you this evening on some subject connected with the comparative anatomy of the teeth, I thought that it might be of interest to the members of the Society if I put together, in a connected manner, some observations collected at various times and from various sources relating to the first or milk dentition of those animals of the class Mammalia in which a change of teeth takes place, although I am afraid that there will be little in the communication which is, strictly speaking, new to science.

The structure, modifications of form and position of the permanent teeth of most mammals, the relation of these organs to the habits and food of their possessors, and the indications they afford of general affinity or the reverse, have long formed a favourite study with naturalists, and are now, on the whole, very well understood. With the milk teeth it is different. Their comparatively small size and rudimentary character,

and especially the short period of life during which they are present, render them far less easy of examination than the permanent teeth. In many animals they are, in fact, so evanescent, that it is a matter of considerable difficulty to obtain specimens at the right age to study their characters, much more such a series of specimens as is required for tracing the various stages of their development and replacement. Yet to the zoologist they are replete with interest and importance. Being on the whole far less teleologically modified than the permanent teeth,—that is, having a less direct relation to the particular mode of life of the species,—they are often more important guides to affinity; and their characters, form, development, and persistency, are all circumstances to be taken into consideration in studying classification. Their importance has been recently illustrated by Rutimeyer among the ungulated groups, in which he shows that the milk teeth of recent forms often present more or less resemblance to the permanent teeth of their extinct allies, or ancestors as they are supposed to be upon the hypothesis of evolution.

The dentition of all mammals consists of a definite set of teeth almost always of constant and determinate number, form, and situation, and, with few exceptions, persisting in a functional condition throughout the natural term of the animal's life. In many mammals these are the only teeth which the animal ever possesses; the

set which is first formed being permanent, or, if accidentally lost, or decaying in extreme old age, not being replaced by others. These animals are called monophyodont. But, in the larger number of mammals, certain of the teeth are preceded by others, which may be only of a very transient, rudimentary, and functionless character, or may be considerably developed and functionally occupy the place of the permanent teeth for a somewhat lengthened period, during the growth and development of the latter and of the jaws. In all cases these teeth disappear before the frame of the animal has acquired complete maturity, as evidenced by the coalescence of the epiphyses of the osseous system.

As these teeth are, as a general rule, present during the period in which the animal is nourished by the milk of the mother, the name of "milk teeth,"—"dents de lait,"—"milchzähne,"—has been commonly accorded to them, although it must be understood that the epoch of their presence is by no means necessarily synchronous with that of lactation. Animals which possess such teeth are called diphyodont.

No mammal is known to have, as a normal condition, more than two sets of teeth.

When milk teeth are well developed, and continue in place during the greater part of the animal's growth, as is especially the case with the Ungulata, and, though to a less degree, with the

Primates and Carnivora, their use is obvious, as together they form structurally a complete epitome on a small scale of the more numerous and larger permanent set, and, consequently, are able to perform the same functions, while allowing of the gradual maturation of the latter, and especially while the jaws of the young animal are acquiring the size and strength sufficient to support the permanent set.

Those animals, therefore, that have a well-developed and tolerably persistent set of milk teeth may be considered to be in a higher state of development, quoad dentition, than those that have the milk teeth absent or rudimentary.

It is a very general rule that individual teeth of the milk and permanent set have a close relationship to each other, being originally formed in exceedingly near proximity, and the latter coming to occupy the position in the alveolar border temporarily held by the former, they are spoken of respectively as the predecessors or successors of each other. But this is not invariably the case; milk teeth may have no successors in the permanent series, and, what is far more general, permanent teeth may have no predecessors in the milk series.

The complete series of permanent teeth of most mammals forms a complex machine, with its several parts adapted for different functions; the most obvious structural modification for this purpose being an increased complexity of the individual components of the series from the anterior towards the posterior extremity of such series.

Since, as has just been said, the complete series of the milk teeth often presents structurally and functionally a similar machine, but composed of fewer individual members, the anterior of which are as simple and the posterior as complex as those occupying corresponding positions in the permanent series,—and since the milk teeth are only developed in relation to the anterior or lateral, never to the most posterior of the permanent series,—it follows that the hinder milk teeth are usually more complex than the teeth of which they are the predecessors in the permanent series, and represent functionally not their immediate successors, but those more posterior permanent teeth which have no direct predecessors. character is clearly seen in those forms in which the various members of the molar series are well differentiated from each other in form, as the Carnivora and also in Man.

In animals which have two sets of teeth the number of the teeth of the permanent series which are preceded by milk teeth varies greatly, being sometimes as few as one on each side of each jaw, or sometimes including the larger portion of the series.

Although there are difficulties in some cases

in arriving at a satisfactory solution of the question, it is, on the whole, safest to assume that when only one set of teeth is present these correspond to the permanent set of the diphyodonts. When this one set is completely developed, and remains in use through the animal's life, there can be no question on this subject. When, on the other hand, the teeth are rudimentary and transient, as in the whalebone whales, the upper incisors of ruminants, &c., it is possible to consider them as representing the milk series; but there are weighty reasons in favour of the opposite conclusion.*

I must now illustrate these points by passing in review the best-known facts regarding the milk dentition of the different groups of mammals in order, beginning at the lower end of the scale.

As the Monotremata have no calcified teeth they need not detain us.

The large order Marsupialia consists of animals which, though intimately related in many most important anatomical and physiological characters, differ vastly in their general external form, their habits, and also in the characters of their teeth; these differences being quite as great as those found among many different orders of the large

^{*} Some of these are given in "Remarks on the Homologies and Notation of the Teeth of the Mammalia."—"Journal of Anatomy and Physiology," May, 1869.

placental series of mammals. It is therefore the more surprising to find, and strongly illustrates the importance of the study of this subject in endeavouring to trace real affinities, that they present certain characters common to all the members of the order, and differing from those of other mammals, in their milk dentition.

In the zoology of Castelnau's "Expédition dans l'Amérique du Sud, -- Mammifères " (1855), p. 99, Professor Gervais describes the absence of predecessors to the permanent teeth, except as regards the last premolar, in the American genus Didelphys, or Opossums, animals which have a very fully developed set of teeth, consisting of incisors, canines, premolars, and molars, resembling generally in their construction those of the placental carnivores. More recent and independent observations upon a series of young opossums of several species contained in the Museum of the College of Surgeons have afforded a detailed description of the order of development of their teeth,* showing that the last of the three simple, compressed, pointed crowned premolars in each jaw is preceded by a more complex molar-like tooth, the change taking place when the animal is rather more than half-grown, and that none of the teeth, either in front or behind this one, are pre-

^{*} See "On the Development and Succession of the Teeth in the Marsupialia."—"Philosophical Transactions," 1867, p. 631.

ceded by milk teeth. This is the more important to note because previous authors have described the protruding apices of the permanent incisors, canines, and premolars of the young opossum as milk teeth, imagining that a succession analogous to that of the placental mammals must take place.

But the most remarkable circumstance relating to the milk teeth of the marsupials is, that not only in the American Opossums, but in all the other known forms of the order, the Thylacines, Dasyures, Bandicoots, Phalangistas, Kangaroos, Wombats, &c., however different the number, form, and function of the permanent teeth may be, the same rule prevails with regard to the succession, no tooth having a predecessor but the one which, by its structure and position, appears to be the homologue of the posterior premolar of the placental mammals. It is, moreover, important to note that there is an extreme difference in the amount of development of this milk molar tooth, and in its permanency; as in the Thylacine it is most rudimentary in form and size, and extremely transient, being shed or absorbed while the animal is not more advanced in size and development than a new-born puppy, and before any of the other teeth have cut the gum, and being, therefore, quite functionless; while in the Rat-Kangaroo (Hypsiprymnus) the corresponding tooth retains its

place and function, until the animal has nearly, if not quite, attained its full stature, and is not shed and replaced by its successor until after all the other teeth of the permanent series, including the posterior molars, are fully in place and use.

For details of these changes, I must refer to the paper in the "Philosophical Transactions" before cited, here remarking, by way of correction, that there are still some marsupials in which no succession has yet been observed, such being the Wombat (Phascolomys), the Koala (Phascolarctos), Myrmecobius, and the Dasyures; but it must be remarked that, in the case of some of these, specimens at the right age have not yet been examined.

We thus see that, among the lowest group of existing mammals which have true teeth, the milk teeth, when present, are reduced to the smallest possible number consistent with symmetry, i.e., one on each side of each jaw; that they are also, in some forms, reduced to the most rudimentary condition, and to the most transient duration, and that in some forms they appear to be entirely absent.

This opens an extremely interesting question with reference to the relation of the succession of teeth in mammals with that of the inferior vertebrate animals. How is it that in the lowest known mammals the diphyodent condition is so feebly pronounced, while in reptiles and fish

a large and apparently unlimited reproduction of teeth takes place? To enter into this discussion satisfactorily it would be most important to know the condition of succession of the earliest known progenitors of the existing mammals, the mesozoic marsupials, of which the present Australian forms appear to be the most direct surviving descendants; and it would be necessary, if it were possible, to go still further back to their progenitors, of which we at present know nothing.

A very considerable number of jaws and teeth of various forms of mammals, from Triassic, Oolitic, and Purbeck beds, have been already discovered and described,* but among them there is scarcely any evidence of a successive dentition. The only indications of any change at present noted are two in number:—(1) In a specimen of the lower jaw of Triconodon occisor, in which the last molar is not fully developed, the last premolar appears to be not quite in place, and on a lower level than the preceding premolars and the succeeding true molars; from which it may be inferred that it had recently replaced a preceding tooth, otherwise it would, in all probability, be fully developed as soon as the tooth which is placed immediately behind it in the jaw. † (2) In a specimen, to which the name of Triacanthodon

^{*} See especially Owen on Mesozoic Mammalia.—" Palæonto-graphical Society," vol. xxiv. 1870.

[†] Loc. cit., p. 70

serrula is given, the form of the tooth which appears by its situation, to be the last premolar, somewhat resembles that of a true molar, so as to suggest that it may possibly be a retained milk molar; but its describer remarks that he has "not felt justified to hazard this unique and brittle evidence by burrowing after a possible hidden germ of a successional tooth."*

It will be observed that these two cases both indicate (though they are not sufficient to prove) that if a succession took place in the early forms, it was only in that particular tooth to which it is limited in modern marsupials.

It would appear, then, probable, that in the transition from the lower vertebrate to the mammal, by whatever process it took place, the indefinite repetition of the teeth of the former was lost, and that a monophyodont condition supervened, while the peculiar definite diphyodont mode of succession found in the most highly organized members of the class is a superadded and special mammalian characteristic.

On a general plan of evolution, carried out on a principle at present unknown, it is easy to imagine the stages of a gradual formation of a set of milk teeth in addition to the permanent set, and we cannot fail to perceive the great advantages of such a set to their possessor

^{*} Owen, loc. cit., p. 73.

in their fully-developed condition; but Natural Selection, like all other hypotheses hitherto propounded, appears to me, in this as in so many similar cases, quite inadequate to account for the early stages of the process, however it may have aided in its perfection.

The very singular and rather heterogeneous group of animals associated together to form the order Edentata, which obviously belong to a very low mammalian type, nearly as low, in some respects, as the marsupials, are very aberrant in regard to their teeth. These organs are often entirely absent; and when present, are of a comparatively simple form, have no covering of enamel, are not distinctly divided by form into several groups, as incisors, canines, molars, &c., and are most variable in number, sometimes being multiplied to an immense extent (as in *Priodontes*).

All the Edentata were, for a long time, thought to be monophyodonts, until the discovery in one genus of Armadillos (*Tatusia*) of a very complete set of milk teeth remaining in place until the animal has nearly attained its full stature,* showed the difficulty of generalizing upon such a subject. It is,

^{*} See Rapp, "Die Edentaten," second edition (1852), p. 69; Gervais, "Hist. Nat. des Mammifères," 1855, vol. ii. p. 252; Krauss, "Archiv für Naturgeschichte," 1862, p. 19; Flower, "Proc. Zool. Soc.," 1868, p. 378; and "Journal of Anatomy and Physiology," May, 1869, p. 265

however, remarkable that, although a change of teeth has been shown to occur under very similar conditions in all the three species of this genus, it has not yet been ascertained to take place in any of the other genera of the group. Of course, this may be owing to insufficiency of observation.

With regard to the Sloths, I have myself examined a sufficient number of young individuals to feel almost sure that no change does take place in them; although, as mentioned in another paper,* these are only negative observations, and require further confirmation.

No specimen of *Orycteropus*, or Cape Anteater, which I have examined, including a very young one in the Museum of the University of Cambridge, affords any evidence of a succession of teeth.

In all the members of the great order Ungulata, including both the Artiodactyle and Perissodactyle sections, which are all more or less vegetable-feeders, the milk teeth are well developed, and retained longer in proportion to the general growth of the body than in any other group of mammals. They remain nearly always until after the complete adult stature has been attained, and until the reproductive powers have come into activity. Thus, in the Horse, the last

^{* &}quot;Journal of Anatomy and Physiology," May, 1869, p. 266.

milk molar is not replaced until the end of the third year, and in the Ox often not until the fourth year, while some of the deciduous front teeth are retained to a still later period.*

I have endeavoured to fix, by a more precise method, for comparison of different groups, the period of retention of the milk teeth, as related to the general development of the body; and, for this purpose, have noted, in several species, the condition of the various epiphyses of the skeleton at the time that the last milk molar is replaced by its permanent successor. Unfortunately, the available materials, even in the Museum of the Royal College of Surgeons, are very insufficient for making such an extensive and accurate comparison as is desirable, as it has not hitherto been the custom to collect series of skeletons of even the most common animals at such ages as would be required to afford the requisite data. But the examples now given will, I hope, call attention to this subject.

The only genus among the Ungulata in which I could find a sufficient series of specimens of the right age to determine this point is that of the

^{*} See Rousseau, "Anatomie comparée du Système Dentaire, chez l'Homme et chez les principaux Animaux." Second Edition. 1839. For the milk teeth of Ungulata, see Rütimeyer, "Beiträge zur Kenntniss der fossilen Pferde und zur vergleichenden Odontographie der Hufthiere überbaupt," Verhand. Naturf. Gesellschaft in Basel, 3^{ter} Th., p. 558. 1863.

Chevrotains or Pigmy Deer (Tragulus), so long and erroneously associated with the Musk Deer. In these animals the last milk molar is shed after the three elements of the innominate bone have completely coalesced, after the coracoid has united with the scapula, and after the epiphyses of the lower end of the humerus, the lower end of the tibia, and the upper end of the radius are thoroughly joined with the shaft of the bone, but before all the other epiphyses of the principal long bones of the limbs have united.

I have little doubt but that other Ungulata follow much the same rule, although, as just said, I have not the exact data before me.

Of the characters of the milk teeth of the Ungulata I need say little, as they are, perhaps, better known than those of most other mammals, owing to their long persistence.*

One of the greatest contrasts in the period of shedding of the milk teeth to the last group is afforded by the aquatic division of the order Carnivora, the Seals, in which the teeth of this set entirely disappear either before or within a few days after birth, and are perfectly functionless. Instead of remaining a long time after lactation has completed, they have passed away nearly before it commences, and allow the whole of the permanent teeth to come into place nearly simultaneously,

^{*} Hyrax manifests its ungulate affinities in the size and functional persistence of its milk teeth.

and to be actually fully developed, while the elements of the innominate bone and of the scapula are widely separated, while none of the epiphyses of the long bones are united with the shaft, or even fully ossified, and while the atlas still consists of three distinct bony elements.*

In the ordinary terrestrial Carnivora, such as the Dog and the Cat, the milk teeth are more complete, and serve, for a short period, a functional purpose, though not remaining nearly so long as in the Ungulata. Unfortunately, I am not enabled at present to give the exact comparison with the condition of the skeleton.

In tracing affinities between these forms and the highly modified aquatic Carnivora or Seals, some naturalists have selected the Otters and

^{*} In a specimen of the Common Seal (Phoca vitulina) which was lately born in the Gardens of the Zoological Society, Regent's Park, and which survived its birth exactly one week, the only traces of milk teeth remaining were small rudiments of the upper canine and one molar on one side only. All the permanent teeth were in a nearly equal state of development. For the milk dentition of the seals, see Steenstrup, "Melketandsættet hos Remmesælen, Svartsiden og Fjordsælen" (Phoca barbata, Ph. Grönlandica, and Ph. hispida). Vid. Medd. f. d. Naturh. Forening, 1860. Copenhagen, 1861. Pp. 251-261. - Reinhardt, "Om Klapmydsens (Cystophora cristata) ufödte Unge og dens Melketandsæt." Naturhist Foren Vidensk Meddelelser. Copenhagen, 1864.—Van Beneden, "Sur les Dents de Lait de l'Otaria pusilla." Bulletins de l'Acad. Roy. de Belgique, 2me série, tome xxxi., No. 3. Mars, 1871.—Flower, "Journal of Anatomy and Physiology," May, 1869, p. 269.

others the Bears as those among the ordinary or terrestrial forms which present the nearest affinity to the latter. The arguments are tolerably well balanced, especially when we take the peculiarly modified hind-foot of the *Enhydris* or Sea Otter into consideration; and so this is a case on which the condition of the milk dentition may throw some light.

In the Bears the milk teeth are smaller in proportion to the size of the permanent teeth, and more transient than in any other of the Fissiped Carnivora. In the skeleton of a young Polar Bear (*Ursus maritimus*) in the Museum of the Royal College of Surgeons, all the permanent teeth are in place, while the elements of the innominate bone and the coracoid, as well as all the epiphyses of the limb bones, are quite distinct.

Now, on the other hand, the Otters, even including the Sea Otter,* have nearly as well-

^{*} A good series of the skulls of the Sea-Otter (*Enhydris marina*) are preserved in the Anatomical Museum, at Berlin. In one specimen, $4\frac{3}{10}$ inches long, the milk canines and the two posterior milk molars are in place in both jaws, though the incisors and anterior milk molars have been replaced by the permanent teeth. In another skull, said to be that of a female, five inches in length, and therefore very nearly full grown, the milk canines have been shed; but the second and third upper milk molars, and the third lower milk molar are still retained, though the true molars of both jaws are in place. The milk dentition of this animal is $i\frac{3}{2}$, $c\frac{1}{1}$, $m\frac{3}{3}$; the adult dentition, $i\frac{3}{2}$, $c\frac{1}{1}$, $p\frac{3}{3}$,

developed and persistent milk teeth as most of the other members of the order; and in this respect, therefore, they do not appear to show any transition towards the *Pinnipedia*.

In none of the toothed members of the order Cetacea has any change of dentition been observed. Some of the Sirenia, as the Dugong, on the other hand, appear to show an imperfect or rudimentary diphyodont condition, affecting only the incisor teeth, which may be a retrograde state, supposing these animals to be an aquatic offset or modification of the great ungulate type.

The Rodentia offer some anomalies and considerable variation in the characters of their milk dentition. Thus the two great incisors in the front of each jaw, which are so characteristic of the group, appear never to have predecessors, although in the *Leporidæ*, which have at one period of life as many as three incisors on each side of the upper jaw, one of them (the middle one) is deciduous at an early age, and may, perhaps, be regarded as a milk tooth.

With regard to the molars, the rule seems to be the following. When there are only three (as in the Common Rat), or fewer than three, (as in the Australian Water Rat, *Hydromys*), these are all true molars, and have no predecessors. These animals, then, are truly monophyodont, as long since shown by Rousseau,* though his obser-

^{*} Op. cit., p. 165.

vations have been overlooked in more recent works.*

When the number exceeds three it is by the addition of teeth to the front of the series, which are premolars, and are preceded by milk teeth. In the large majority there is only one on each side of each jaw, but in the *Leporidæ* the number is three above and two below.

A remarkable variation is observed in the character of these teeth, and in the time at which they are matured and shed. Thus, in the Guineapig and its allies, the one milk molar—a small, though tolerably well-formed tooth—is absorbed or shed a short time before birth; while in the Porcupines and Beavers the corresponding tooth is retained until the animal has nearly attained the adult condition.

Observations on the condition and period of development of the milk teeth of numerous genera of Rodents are still needed.

As regards the Insectivora, the few species in which the milk teeth have been accurately observed present great differences. In the Hedge-

$$m\frac{2-2}{2-2} = 16$$
: of *Hydromys*, $i\frac{1-1}{1-1}$, $p\frac{1-1}{1-1}$, $m\frac{1-1}{1-1} = 12$.

^{*} Thus, in the catalogue of the Osteological Series of the Museum of the Royal College of Surgeons (1853), vol. ii., the dental formula of the genus Mus is given as $i\frac{1-1}{1-1}$, $p\frac{1-1}{1-1}$,

hog (Erinaceus)* and the Tenrec (Centetes)† the first set of teeth are well developed and functional, being retained until the animal is nearly full-grown; while in the Moles‡ and Shrews§ they are rudimentary and comparatively transient, especially in the latter family.

Very little is known of the milk dentition of the other families of this order.

The Chiroptera, or Bats, offer a wide and interesting field for observation to any one who has the opportunity. Out of about four hundred known species, the milk dentition has been described in not more than three or four, and only imperfectly in these. It appears to be always of a very rudimentary character and transient duration.

The PRIMATES, on the other hand, are much better known, all having a well-developed and functional set of milk teeth, which persist about as long as in the terrestrial Carnivora, and therefore for a much shorter time than in the Ungulates.

^{*} Rousseau, Op. cit., p. 333.

[†] Reinhardt, "Mælketandsættet og Tandskiftningen hos Centetes ecaudatus." Oversight over d. K. D. V. Selsk. Forhandl. o.s.v. f. 1869. No. 3.

[‡] Spence Bate, "On Dentition in the Mole (Talpa Europæa)."—"Trans. Odont. Soc.," vol. v. p. 261 (1867).

[§] Owen, "Odontography," p. 423 (1845).

^{||} Rousseau, Op. cit., 321 (Vespertilio). Owen, Op. cit., p. 433 (Pteropus).

[¶] The very aberrant lemuroid genus Chiromys (the Aye-Aye of Madagascar) is quite exceptional, both in its adult and milk dentition. For the latter see Peters, "Abhandlungen der Königl. Akad. d. Wissenschaften." Berlin, 1865.

I find that in the Monkeys of the genera *Macacus* and *Cercopithecus* the last milk molar is shed when the elements of the os innominatum have nearly coalesced, and the coracoid is united to the scapula though with traces of the original separation remaining, and after the union of the epiphysis of the lower end of the humerus, though before that of any other of the principal bones of the limbs.

In Man the last milk molars are shed about the tenth year, which is a relatively earlier period to that just described; for the ischium, ilium, and pubis are still separate, also the coracoid and the scapula, and all the epiphyses of the long bones.

I have not said anything of the relative order of appearance and of persistence of the different members of the milk series among themselves; but this is a point that should be attended to in a complete treatment of the subject, although it would lead me too far into minute details to be consistent with the present sketch. I may remark, however, that certain differences have been noted in the relative order of disappearance of some of the milk teeth, and in the production of their permanent successors, between Man and the anthropomorphous Apes; thus, the permanent canines of the latter replace their deciduous successors at a later period compared with the molars than in Man. Examples of similar variation of the order of succession in other not very dissimilar forms will frequently be met with, although their details have not hitherto been observed and recorded as fully as they deserve.

I trust that I have said enough, in this imperfect outline, to prove the importance and interest of a closer study of the characters and period of development of the milk teeth, and, by showing the deficiencies of our present knowledge, to stimulate members of this Society, who may have leisure and opportunity, to contribute whatever is in their power towards a fuller elucidation of the subject.

The President said he should be happy to hear any remarks gentlemen might have to make on the very interesting paper they had just heard. It was to them a novel phase of odontological science.

No one responding, the President said he was afraid they must confess to a very cursory acquaintance with a subject so full of deep interest, and one which he hoped would stimulate their members, especially the younger portion, to make those investigations that were still necessary for a better understanding of the subject. To his mind it was peculiarly interesting to notice the characteristic absence of the deciduous teeth in the lower type of mammals, the marsupials, save of those four premolars; and that in the rat, a placental mammal, the deciduous teeth should so unexpectedly be wholly absent. It was very remarkable that some animals, during the intrauterine period of existence, should be endowed with teeth, for which they could have no possible use; and that in many cases the temporary teeth disappeared so early that they, for a long time, escaped observation. He considered that the Society had been much favoured in hearing a paper read on so

interesting, yet unfamiliar a subject, and so full of the result of patient research. Personally, he felt deeply indebted to the able professor, as several gentlemen of scientific eminence had given a promise to read papers, accompanied with the invariable request, "Put us down last;" but Professor Flower had kindly responded to the petition for an early date. On the part of the Society, he begged to convey to Professor Flower their cordial thanks for the able and highly suggestive paper he had read before them.

The Meeting was then adjourned.



GENERAL MONTHLY MEETING,

Monday, June 1st, 1871.

J. R. MUMMERY, Esq., President, in the Chair.

The Minutes of the last Meeting were read and confirmed.

The following gentleman was duly elected a member of the Society:—

Mr. THOMAS EDGELOW, M.R.C.S., 25, Mount Street, W.

MR. FOX'S PAPER.

Mr. C. J. Fox said it would be in the recollection of the President and members that he undertook to make his reply at this meeting to the observations kindly offered on the paper entitled "A few Words on the Extraction of Teeth," which he had read at the March meeting. But, unfortunately, he had looked in vain for the appearance of the Transactions to refresh his memory on the subject, which had occurred now two months ago; and as those Transactions had not appeared, he must claim the indulgence of the meeting for not fulfilling his promise then, but he hoped to do so at a future time.

The President was sorry that circumstances had occurred (circumstances to which he need not more particularly refer) which had retarded the publication of the reports of the two last meetings; but he trusted that, without much further delay, they would be in the hands of members.

Mr. C. J. Fox exhibited to the Society a lathe, contrived, so far as there was anything original in it, by Mr. Williams, of Warwick, and Mr. Appleby, two former students of the Hospital, for use in the operating-room: the action was rather short, but use would overcome that difficulty. There was also

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an ingenious little arrangement of the sponge for wetting the wheel. On the frame of the lathe before them was a label bearing the inscription, "Presented to the Dental Hospital by a former Student."

Mr. Coleman had a few casual communications to bring under the notice of the Society, and, as they all were connected with the same subject, he thought he should economize the time of the Society by stating them seriatim: - The first it was his pleasure to call their attention to, was an ingenious gag for keeping the jaws apart whilst employing nitrous oxide, devised by Mr. Hutchinson, a pupil at the Dental Hospital. It consisted of a horse-shoe form of spring, to the extremities of which were attached pieces of metal guarded with gutta-percha, which, when the instrument was used, were adapted to the incisors of the upper and lower jaw; these latter were attached to the former by swivels, so that the spring portion of the instrument could be moved to either side of the mouth, and quite out of the way of the operator: a stop regulated the distance; the mouth, when acting upon the spring, could be closed to. had the great merit of simplicity, and appeared to him to fulfil everything the designer of the instrument intended. matter he would call their attention to was a neat and portable nitrous oxide apparatus, devised by Messrs. Barth & Co. A small mahogany case containing an oval-shaped copper gasbottle, holding twenty gallons of the gas compressed; a thin rubber bag communicating with the same, tubing, taps, and face-pieces; the whole being very simple, light, and compact. He would now show them a very simple contrivance for always enabling them to have the pads of their face-pieces tense. Both air and water, they were aware, found their way, after a time, through india-rubber. To the pad, then, he had connected a small india-rubber tube, through which, at any time, air or water could be introduced, and which was made secure with a wooden plug. Lastly, he would call their attention to the advantage he had found of administering nitrous oxide through the nose, the mouth being covered during the inhalation. Mr. Clover adopted the plan of rendering the patient unconscious with the face-piece, and then rapidly substituting a

nose-piece, which certainly prolonged the time of anæsthesia. He thought, however, that if patients were rendered unconscious by breathing through the nose only, there would be more chance of their continuing to do so when the mouth was opened afterwards, than if they had been breathing previously through the nose and mouth, or mouth only. The best results he had yet seen had in several cases attended this plan of inhalation. Mr. Coleman then exhibited the instrument he had employed for administering nitrous oxide through the nose.

The President said that Mr. Coleman's excellent suggestion was an illustration of the not infrequent occurrence, that two observers, engaged in the study of a subject, had independently arrived at a similar discovery. For some little time past, in connection with his own practice, he had experienced increased facility in operating, by means of Mr. Clover's method of prolonging the effect of nitrous oxide gas. the oro-nasal face-piece was duly placed, Mr. Clover requested the patient to try to "snore," and it was found that this mode of breathing was so steadily maintained, that on the substitution of the simple nasal inhaler, the patient still breathed exclusively through the nostrils, the anæsthetic condition being thus conveniently prolonged. The only inconvenience arose from obstructing the view of the last molar; but he believed that some modification in the attachment of the tube would obviate this difficulty. The President regarded the gag devised by Mr. Hutchinson as a most valuable invention, and one for which all would be thankful, in cases where operations were needed on both sides of the mouth.

Mr. Bell Longhurst presented to the Society a portion of the lower jaw of a lamb, containing a dentigerous cyst. He said that the body of the jaw, immediately behind the temporary incisors, was distended into a large cyst of the size of a walnut, in the centre of which, embedded in ropy matter, a permanent incisor was found.

The President asked if it was as it then appeared.

Mr. Longhurst said the tooth was slanting forwards, and

its undeveloped fang was attached to a membrane which lined the cyst.

The President inquired if the sac was full of pus?

Mr. Longhurst replied that it was, and pointed externally. When the disease was discovered, the animal was slaughtered and that portion of the jaw saved and prepared by the gentleman who sent it to him; it was boiled, and the temporary incisors were lost. A few weeks ago, through the courtesy of Professor Pritchard, of the Royal Veterinary College, he had been permitted to examine the collection in the museum, and he could not find a specimen of dentigerous cyst in the sheep; and was informed by Professor Pritchard that the disease was exceedingly rare in the sheep, and that this was the first instance of a disease of a similar nature that he had witnessed in the lamb.

The President then inquired if he had not found proof of the disease in the sheep?

Mr. Longhurst said, no; but he had found there were two excellent specimens of the disease in the sheep in the museum of their own Society, and must congratulate the Society upon being so fortunate as to possess them.

The President was of opinion that the injury was the result of mechanical violence. He had in his own cabinet a very similar specimen of a sheep's lower jaw, in which the cavity was filled with pus, and three teeth were hanging by the integuments, the socket-walls having been entirely absorbed. In both cases the mischief probably arose from the blow of a stick or a stone. He would have much pleasure in contributing the specimen to the museum.

Mr. Coleman said that there was in the museum of St. Bartholomew's Hospital a specimen, also occurring in the sheep, very similar to that brought before the Society.

The President then called upon Professor Rolleston to read his paper, "On the Development of the Enamel in the Teeth of Mammals."

On the Development of the Enamel in the Teeth of Mammals, as illustrated by the various Stages of Growth demonstrable in the Evolution of the Fourth Molar of a young Elephant, Elephas indicus, and of the Incisor Teeth in the Fætal Calf, Bostaurus. By Professor Rolleston.

GENTLEMEN,-

A NAKED-EYE examination of a spirit preparation of a developing molar tooth of an Elephant, such as is represented in fig. 1, appears to be sufficient to show that in development the dentine takes precedence of the enamel in the tooth. In such a tooth a certain number of the more anteriorly placed denticles may be seen to be formed of caps of dentine, of a yellowish colour, encrusted, for various distances from their apices downwards, with opaque white deposits of enamel. Posteriorly to the denticles of this composite character, we see a few denticles consisting of dentine alone, upon which no deposition of enamel has as yet taken place; and, most posteriorly of all, we see processes of the dentinal pulp, which, as yet, are devoid of any covering of dentine.

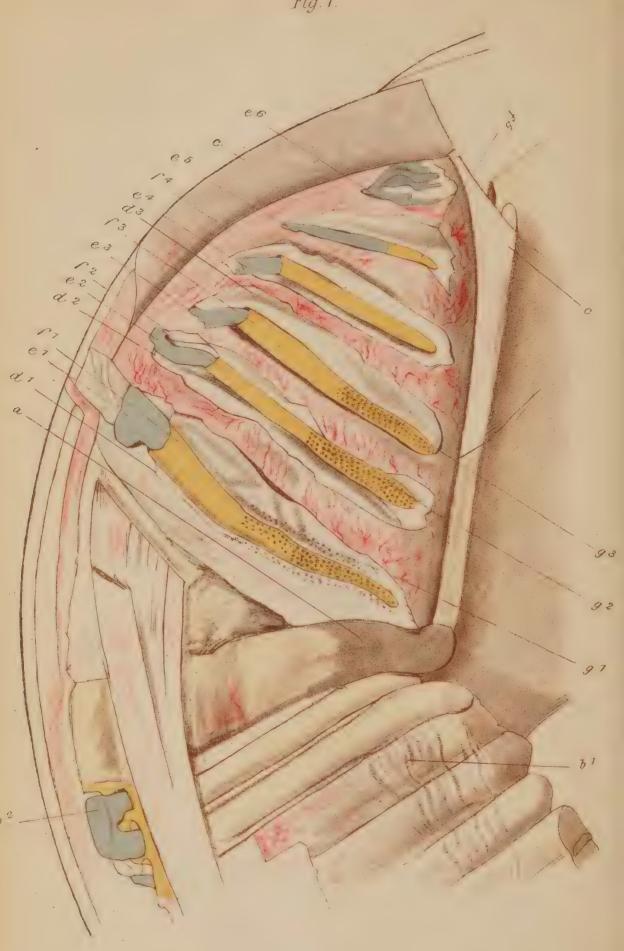
If, in the second place, we proceed to take note of the capsular processes in which the denticles are enclosed, we shall observe that the inner (reflected)

surfaces of certain of these capsules are roughened over by deposit, in correspondence with the enamel deposit already noticed on the denticles which they surround. The deposit on the inner surface of the capsule is soft, and consists of cylindriform cells packed closely together, and forming, when their interior surface is looked down upon, a mosaic arrangement by their apposition, whilst in the immediate neighbourhood of their exterior (their still attached) surface, numerous bloodvessels are seen ramifying. There can be no doubt that we have here the often-described proximal, and, as yet, but imperfectly calcified ends of the enamel-cells, which have broken away in the preparation from the more thoroughly calcified segments constituting the enamel deposit on the denticles. It is, in fact, the layer which has been supposed to be at once the functionless "membrana præformativa" of Raschkow, and the functionally protective, however otherwise physiologically inert, "cuticula dentis," or "Nasmyth's membrane."

If now, in the third place, we take a thin microscopic section of the anterior part of the lower jaw of a feetal calf (see fig. 2), made in a sagittal direction, so as to show several developing teeth of various ages in situ, we are enabled easily to recognize the representatives of the various structures visible to the naked eye in the molar tooth of the elephant, and to harmonize the



Fig. 1.



DESCRIPTION OF FIGURE 1.

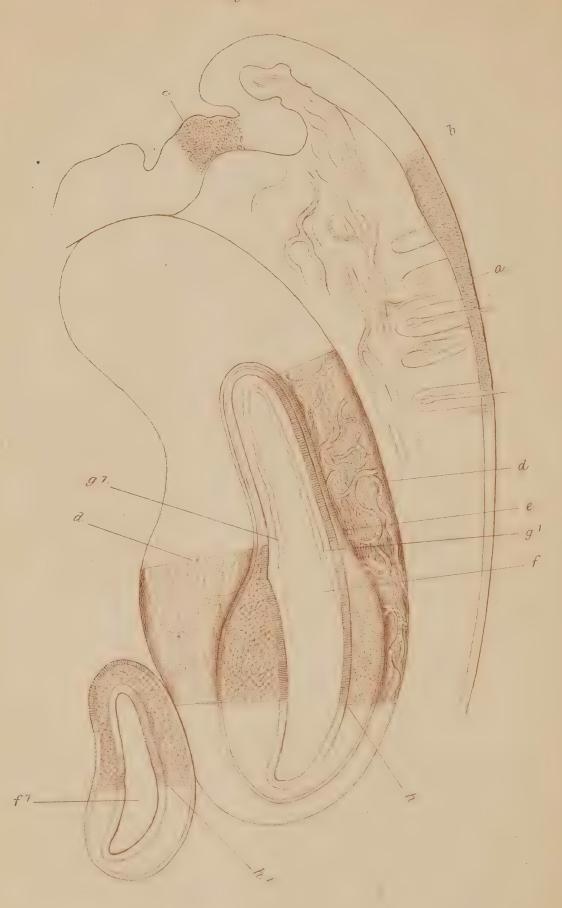
- Fig. 1. Portion of left half of lower jaw of young Elephant, Elephas indicus, showing the fourth molar in course of development, and a part of the third molar, some of the denticles of which were in use, and some still within their socket. The teeth are seen from the inner side, the bony wall having been removed, and the capsule of the posterior tooth having been reflected. The dentinal pulp is coloured blue, the dentine yellow; the vessels are represented as seen when filled with a red injection. From a preparation made by Mr. C. Robertson.
 - a. Part of inner side of lower jaw interposed between the posterior denticles of the third and the anterior denticles of the fourth molar.
 - b¹. Part of third molar tooth. Its anterior denticles were in use; some of its more posteriorly placed were just about to cut the gum, and the most posteriorly placed were still within the bony socket.
 - b². Processes of dentinal pulp, dividing to supply the denticles of third molar.
 - c. Sac of tooth reflected and fastened out over the jaw above and below.
 - d^1 , d^2 , d^3 . Capsular processes surrounding denticles. On the internal or dentinal aspect of the most anteriorly placed of these, d^1 , a granular deposit is observable. This deposit corresponds to a depost, g^1 , of similar appearance, which encrusts the upper part of the cap of dentine, f^1 , and it represents the proximal ends of the enamel columns which have broken away from the more perfectly calcified segments which constitute the (enamel) deposit, g^1 , on f^1 .
 - e¹, e², e³, e⁴, e⁵. Processes of the dentinal pulp passing up to form the successive denticles of which the composite molar is made up.
 - e⁶. A number of processes homologous with those similarly lettered, but differing from them in having as yet formed no cap of dentine upon their exterior surface.

 $f^{1}, f^{2}, f^{3}, f^{4}, f^{5}$. Caps of dentine which have been formed by the processes of dentinal pulp, $e^{1}, e^{2}, e^{3}, e^{4}, e^{5}$. Upon the three most anteriorly-placed of these caps of dentine, f^{1}, f^{2}, f^{3} , a deposit of enamel has taken place, the area occupied by which diminishes in length from before backwards, in correspondence with the lessening evolution of the denticles. Upon the two most posterioly placed, f^{4} , f^{5} , of the dentinal caps no deposition of enamel has as yet taken place.

 g^1 , g^2 , g^3 . Level to which the deposit of enamel has reached upon the dentinal caps f^1 , f^2 , f^3 , respectively.



Fig. 2.



DESCRIPTION OF FIGURE 2.

- Fig. 2. Section of anterior portion of lower jaw of feetal calf, Bos taurus, taken in an antero-posterior or sagittal direction; showing the enamel organs of two teeth, one larger and the other smaller, in situ. The section has passed through the lateral portion of each tooth; and as the incisors in this species have their crowns laterally expanded, whilst their fangs are compressed from side to side, the central stem of the dentinal pulp is not seen in this section, and the enamel organ passes entirely round its lateral expansion. The dentinal pulp itself is not represented in either of the two teeth; two contour-lines, bounding the apical half of the space which it occupied in the larger of the two teeth, show the extent to which the deposition of enamel and dentine severally had proceeded upon it. In the smaller of the two teeth the deposition of enamel has not commenced, and the enamel organ has as yet suffered no diminution of its "spongy," or "gelatinous," or "stellate" tissue. This drawing being semidiagrammatic, segments only of the histological elements making up the epithelium of the gum, the epidermis of the lip, the tooth-sac, and the enamel organs, have been given; the contour-lines prolonged in each case from the external boundaries of these segments, appearing to indicate sufficiently the relations held in nature by the several structures.
 - a. Anterior surface of lip.
 - b. Epidermis of lip.
 - c. Epithelium of gum.
 - d. Tooth-sac, which at this stage in the development of the tooth, and before it receives any support from the bony structures in the jaw, is clearly marked off by layers of condensed cellular tissue from the strata of cutis vera, which are interposed between it and the external epidermis. The loose spongy central portions of the tooth-sac bear some resemblance, when viewed with the unassisted eye, to the similarly placed stellate element of the enamel organ; they differ from it, however, by

being vascular, and even highly vascular; whilst they differ from the *cutis vera*, not merely by their greater looseness of texture and their greater vascularity, but also, as seen in the figure, by the absence of glands, of hair-bulbs, and of muscular tissue.

- e. Enamel organ. From the point to which the line e is drawn, downwards, the enamel organ of the larger tooth is seen to possess all the three structures; viz., the inner epithelium, the stellate or spongy tissue, and the outer epithelium, which the enamel organ of the smaller tooth (h¹) still possesses. Above the point to which the line e is drawn, the stellate tissue has disappeared, and the two layers of the enamel organ's epithelium have come into apposition. Thus the epithelial cells of the inner layer, which produce the enamel prisms, or "fibres," come into closer relation with the bloodvessels of the tooth-capsule, whence alone, in the absence of vessels in the enamel organ, they can provide themselves with the requisite mineral matter.
- f. Space in the larger tooth occupied by the laterally projecting portion of the spoon-shaped dentinal pulp.
- f^1 . Corresponding space in the smaller tooth: in neither tooth did the central stem of dentine come into view in this section.
- g¹. Contour-line indicating the extent to which the deposition of enamel has proceeded in the larger tooth. This line corresponds to the similarly lettered granular deposit in fig. 1. Internally to this line, a second line is seen describing a similar contour, but reaching considerably further down. It indicates the extent to which the cap of dentine reaches downwards upon the exterior of the pulp; this extent being considerably greater (as is seen also in fig. 1) than that attained to by the deposit of enamel at this period of development.
- h and h^1 . Line of junction, in the larger and smaller tooth respectively, of the stellate tissue of the enamel organ to its inner layer of epithelium. In both enamel organs the outer layer of epithelium is drawn as more nearly columnar than it is in nature.

apparently conflicting statements which have been made as to the relations held by the tissue forming the enamel prisms, on the one hand, to the stellate tissue of the non-vascular enamel organ, and, on the other, to the vascular tooth-capsule. In such a section of a tooth, in which the enamel has already begun to be deposited, we can see (fig. 2, c), the factor of the enamel organ, which is made up of stellate, loosely-compacted anastomosing cells, the so-called "spongy substance," occupying or forming a triangular area with the apex upwards. The apex of this triangular space marks the lowest level to which the formation of enamel has advanced in its progress downwards from the summit of the tooth. Above this point, or, in other words, where the formation of the enamel has called for an abundant supply of mineral matter, the non-vascular stellate tissue has disappeared, and allowed the vessels of the tooth-capsule to come into close relation with the enamel-forming cells which draw so largely upon what they contain. Below this point the stellate tissue gradually re-assumes its original proportions, and in a section of the lateral portions of the spoon-shaped incisors of the calf it may be seen to pass completely round the calcifying dental pulp from its buccal to its lingual surface. The area occupied by this stellate tissue in fig. 2 corresponds, of course, to the parts of the cavities of the capsular processes of fig. 1, which lie below

the level of the enamel deposit on the denticles; the disappearance of the stellate tissue in the molar of the elephant, and the separation in that preparation of the upper part of the capsule from the depositing enamel, are alike what the Germans call artefacta.

Much of what has been advanced in this short paper may be found explicitly or implicitly stated in some one or other of the numerous memoirs or treatises on the development of the teeth which have appeared of late. It is believed, however, that as yet it has not been recorded that the enamel of the Elephant's molar, as also that of the Mastodon's, presents the very same decussating arrangement of the inner portion of its enamel which Mr. Tomes has figured ("Phil. Trans.," 1850, pl. xliv., xlv., xlvi.), as noted by him in the Rodentia, less the Leporidæ and Hystricidæ. Thus the rodent affinities of the elephant, which have so often been commented upon, receive a fresh illustration.

DISCUSSION.

The President said he would be glad to hear any remarks that gentlemen might wish to make upon Professor Rolleston's paper.

Mr. Ibbetson said that he did not know whether he had understood Dr. Rolleston rightly, but he believed that in one part of the paper he had expressed his opinion that the dentinal pulp underwent calcification before the enamel pulp. On this

assumption it would be difficult to account for the hexagonal impressions which are found on the peripheral surface of coronal dentine, which are supposed to be caused by the dentinal extremities of the enamel prisms; but it could scarcely be supposed that so hard a substance as dentine could be capable of receiving such impressions. He would therefore suggest that the calcification of the periphery of the dentinal pulp, and the dentinal extremities of the prisms of the enamel, were probably synchronous,—an hypothesis on which the hexagonal impressions alluded to were easy of explanation.

Mr. C. Tomes thought that it would be a pity to allow Prof. Rolleston to go from amongst them without obtaining his opinion more fully on one or two most important points in Tooth Development, which had been touched upon in his paper.

From a comparison of the views expressed by the most recent writers, two or three different structures appeared to have been described under the name of Membrana Præformativa; while it was quite an open question whether such a membrane existed at all, its presence being only demonstrable by the use of re-agents, and being explicable on the ground of a chemical change preparatory to calcification, which takes place along a plane immediately in advance of the portion already calcified. On the whole, there was hardly sufficient evidence of the existence of a distinct membrane in any of the situations in which it had been described. Again, it appeared to him (Mr. Tomes) that the condition of the Enamel organ, which had been described by Professor Rolleston as existing at one part of the developing elephant's tooth, might have seemed to have thrown some light on the structure known as the Enamel Cuticle, or Nasmyth's Membrane. In Stricker's Handbook, the view expressed as to its nature was, that it was not, as supposed by his father, Mr. Tomes, a continuation of the cement over the crown of the tooth, but that it was an epithelial structure, not calcified but cornified; that it was, in fact, the cornified external layer of epithelial cells of the Enamel organ.

The internal epithelium of the Enamel organ formed, by its calcification, the enamel, the intervening stellate tissue disappeared, and the external epithelium of the Enamel organ, as it came into contact with the formed enamel, became cornified, and formed Nasmyth's membrane.

The Enamel organ, as described by Professor Rolleston, would probably afford a favourable opportunity of solving that question, viz.: whether Nasmyth's membrane was or was not a product of the external epithelium of the Enamel organ. For although it was hardly probable that a structure would become cornified which was afterwards to be overlaid by cementum, yet it would be instructive to see what became of that layer of cells under those circumstances; and if they were found to totally disappear or become fused with the characteristic long enamel cells, it would render it less probable that in other mammals, they should become cornified, and differentiated into a distinct structure. They would all very much value Professor Rolleston's opinion on those disputed points, and would hear with great interest to which side he would lend the weight of his authority.

The President asked if any other gentleman would take part in the discussion upon the professor's most instructive paper; if not, he would call upon Dr. Rolleston to reply, if he felt so inclined, to the remarks of Messrs. Ibbetson and Tomes. He was sure that from the deep treasures of Professor Rolleston's knowledge he had but brought out a few hints of the keen interest pertaining to the study of comparative anatomy. He feared that, correlated as these subjects were to their own pursuits, they did not bestow upon them the attention they deserved; and he hoped that by listening to Dr. Rolleston's most instructive discourse, many members of the Society would be stimulated to the pursuit of so fascinating a science.

Professor Rolleston said that very much confusion existed, both as to the situation and as to the genesis of the various membranes or films detectible in microscopic sections, or producible upon free surfaces of teeth by the action of acids. Mr. Ibbetson's

objection assumed that the hexagonal "depressions" on the coronal dentine were dentinal formations. This was open to question. It was, or at least might be, advanced that these "depressions" were the optical representation of the agglutinated and flaked-off ends of the coronal apices of the enamel columns. This view he, Professor Rolleston, held. Tomes, in the Quarterly Journal of the Microscopical Society for 1856 (vol. iv., pl. xv., figs. 2, 6, p. 216), had figured and described the "enamel columns" as undergoing a "circumferential dilatation" just where they become continuous with the calcifying "enamel fibres." Now an aggregate of such circumferential dilatations, if taken as formed in contact with the dentine, just as the process of calcification was beginning in the enamel organ's internal epithelium, would give the very appearance which Mr. Tomes had some years before, in 1848, figured in his "Lectures on Dental Physiology and Surgery," fig. 18, p. 35. Kollmann's paper in the Sitzungsberichte der K. Bayer, "Akad. der Wissenschaft zu München," p. 162, Feb. 6, 1869, went to the same purpose so far as he recollected. The "membrane," if so it could be called, thus formed, would be the first, as "Nasmyth's membrane," the "cuticula dentis," was the last result of the process of induration, as taking place in the enamel organ. With the views spoken to by Mr. C. S. Tomes he was disposed to agree. The "cuticula dentis," or "Nasmyth's membrane," may be supposed to be represented by the sharp line which limits the enamel off from the cement in such teeth as the incisors of the Wombat, of which Mr. Tomes's father had written. "Philosophical Transactions," 1850, p. 534.

The President was sure that the members all felt deeply indebted to Professor Rolleston for his most valuable contribution to their "Transactions," and in the name of the Society he begged to tender their best thanks.

The meeting was then adjourned to the first Monday in November.



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